



UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO
POSGRADO EN CIENCIAS DE LA SOSTENIBILIDAD
INSTITUTO DE INVESTIGACIONES EN ECOSISTEMAS Y SUSTENTABILIDAD

DIMENSIONES SOCIALES DE LOS CONFLICTOS DE CONSERVACIÓN EN DOS
RESERVAS DE LA BIÓSFERA EN LA PENÍNSULA DE YUCATÁN, MÉXICO

TESIS
QUE PARA OPTAR POR EL GRADO DE
DOCTORA EN CIENCIAS DE LA SOSTENIBILIDAD

PRESENTA:
MALENA OLIVA

Tutor Principal
DR. EDUARDO GARCÍA FRAPOLLI
Instituto de Investigaciones en Ecosistemas y Sustentabilidad

Miembros del Comité Tutor
DR. SALVADOR MONTIEL ORTEGA
Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional
DRA. LUCIANA PORTER BOLLAND
Instituto de Ecología A.C.

CIUDAD UNIVERSITARIA, CIUDAD DE MÉXICO, DICIEMBRE 2019



Universidad Nacional
Autónoma de México

Dirección General de Bibliotecas de la UNAM

Biblioteca Central



UNAM – Dirección General de Bibliotecas
Tesis Digitales
Restricciones de uso

DERECHOS RESERVADOS ©
PROHIBIDA SU REPRODUCCIÓN TOTAL O PARCIAL

Todo el material contenido en esta tesis esta protegido por la Ley Federal del Derecho de Autor (LFDA) de los Estados Unidos Mexicanos (México).

El uso de imágenes, fragmentos de videos, y demás material que sea objeto de protección de los derechos de autor, será exclusivamente para fines educativos e informativos y deberá citar la fuente donde la obtuvo mencionando el autor o autores. Cualquier uso distinto como el lucro, reproducción, edición o modificación, será perseguido y sancionado por el respectivo titular de los Derechos de Autor.

Coordinación de Estudios de Posgrado
Ciencias de la Sostenibilidad
Oficio: CEP/PCS/970/19
Asunto: Asignación de Jurado

M. en C. Ivonne Ramírez Wence
Directora General de Administración Escolar
Universidad Nacional Autónoma de México
Presente

Me permito informar a usted, que el Comité Académico del Programa de Posgrado en Ciencias de la Sostenibilidad, en su quincuagésima sesión del 10 de septiembre del presente año, aprobó el jurado para la presentación del examen para obtener el grado de **DOCTORA EN CIENCIAS DE LA SOSTENIBILIDAD**, de la alumna **Oliva Malena** con número de cuenta **516492762** con la tesis titulada "Dimensiones sociales de los conflictos de conservación en dos reservas de la biósfera en la península de Yucatán, México", bajo la dirección del Dr. Eduardo García Frapolli.

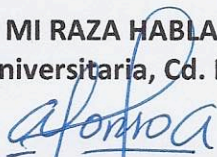
PRESIDENTE: DRA. AMY MICHELLE LERNER
VOCAL: DRA. BÁRBARA AYALA OROZCO
SECRETARIO: DRA. MARÍA FERNANDA FIGUEROA DÍAZ ESCOBAR
VOCAL: DRA. LUCIANA PORTER BOLLAND
VOCAL: DR. SALVADOR MONTIEL ORTEGA

Sin más por el momento me permito enviarle un cordial saludo.

ATENTAMENTE,

"POR MI RAZA HABLARA EL ESPIRITU"

Cd. Universitaria, Cd. Mx., 22 de noviembre de 2019.



Dr. Alonso Aguilar Ibarra
Coordinador

Posgrado en Ciencias de la Sostenibilidad, UNAM

Agradecimientos institucionales

Un agradecimiento al Posgrado en Ciencias de la Sostenibilidad de la Universidad Nacional Autónoma de México que me permitió realizar mis estudios y llevar a cabo este proyecto.

A la Coordinación de Estudios de Posgrado (CEP) por la beca otorgada en el primer año de este doctorado, haciendo posible su despegue.

Agradezco al Consejo Nacional de Ciencia y Tecnología (CONACYT) por la beca otorgada durante los siguientes tres años de doctorado, permitiendo su desarrollo y culminación.

Un agradecimiento al proyecto de investigación PAPIIT-IN302517, Gobernanza de las áreas protegidas de México: manejo de recursos, conflictos de conservación y mecanismos de resolución, por haber financiado esta investigación.

Al Programa de Apoyo a los Estudios de Posgrado (PAEP) de la Universidad Nacional Autónoma de México por su generoso apoyo en dos ocasiones, que me permitieron compartir parte de la experiencia de mis estudios con profesionales de otras latitudes y contextos, y acceder a escenarios de ricos intercambios.

También agradezco a la Beca de Movilidad que se me otorgó en la etapa final del doctorado, haciendo posible una estancia de investigación con uno de los investigadores que más ha influido mi trabajo: gracias a la Universidad de Aberdeen y al Profesor Steve Redpath y su equipo por recibirme y por la disposición al intercambio.

En especial, agradezco a los miembros de mi comité tutor.

A Luciana Porter Bolland por sus aportes a los documentos escritos que me ayudaron a tener perspectiva sobre el trabajo.

A Salvador Montiel Ortega por seguir participando de manera comprometida y activa en mi proceso de formación.

Finalmente, a mi tutor principal, Eduardo García Frapolli, por ayudarme a simplificar ideas y desenmarañar procesos, y el apoyo estratégico para llevar adelante este proyecto de doctorado.

Agradecimientos personales

A mi familia por su presencia, sentida aún a la distancia, y el amor incondicional.

A Lucas, por ayudarme a situar este proyecto en un marco global de vida y a no perderse de vista a uno mismo en el camino.

A los amigos que han permanecido a mi lado aún con el paso del tiempo y la lejanía, y a los que han estado cerca y firmes, por el soporte.

A las familias que me acompañaron, adoptaron y cobijaron durante el trabajo de campo y después. En especial a Don Socorro y Doña Adolfina por brindarme su amor fraterno y hacerme sentir que nunca estaría sola.

A Vicky por ser mi amiga y compañera. A Felipe por mostrarme la dignidad campesina. A Doña Tila por su amor y cuidado.

A José por conectarme con el placer de escribir mi propia tesis, balancearme, recordarme el disfrutar aún en momentos convulsos y acompañarme multidimensionalmente en este proceso.

A mi can Patas por acercarme de manera instantánea a la felicidad, y por sacarle sonrisas a la gente todo el tiempo.

A Lakshmi, Shiara y Abril, por la motivación intelectual y compartir momentos intensos como la celebración de la candidatura. A Lakshmi por su carácter franco y el compartir sin tapujos.

A Perla, Vladimir, Paco, Evelyn, Emilio y todos los que me ayudaron con trámites y papeleo desde Morelia y CDMX.

A Noé por el entusiasmo y apoyo durante la primera etapa del doctorado. Por haber sido un compañero intelectual estimulante. Gracias por los momentos de compañerismo y ternura.

A la familia Mendoza-Fuente por la ayuda y cariño. Gracias por cuidarme y mimarme.

A Pepe Zúñiga, por enseñarme un montón de cosas en las charlas que tuvimos. Por mostrar su sensibilidad. Por hacerme pensar, sembrar la semilla de la reflexión y haber incidido de esa manera en la concepción de este trabajo.

A Birgit Schmook y Sophie Calmé por mostrarme con el ejemplo cómo vincular la academia y práctica de la conservación en Calakmul. Birgit, gracias también por escuchar en el momento justo y, sin saberlo, impulsarme a hacer más.

A S. Redpath por abrirme las puertas de su laboratorio y recibirme en tierras frías. A Petra, por las aventuras y las charlas sobre el trabajo y la vida, por las oportunidades a las que me acercó, por ser tan generosa y desinteresada, por la amistad. A Zara, por las discusiones académicas y empatía. A Sri, por la compañía y convivencia, tan importantes en un lugar distante. A Karen por las estimulantes y enriquecedoras charlas. Fue corto el tiempo, pero lo compartido con ustedes dejó huella.

A mis sinodales Bárbara, Amy y Fernanda, por la valiosa retroalimentación, el compromiso en la revisión de la tesis, por brindar su mirada al trabajo y así enriquecerlo, y por la invitación a la reflexión.

Al LAECBIO y sus miembros, en Cinvestav-Mérida, por siempre recibirme y poder seguir compartiendo con ustedes; es una extensión de casa.

Al Dr. Montiel, por recordar siempre lo elemental y promover la formación de criterio. Por darme un espacio, no sólo material, sino en la vida del laboratorio. Por compartir el lujo de reflexionar de manera conjunta. Por ser una contraparte con quien discutir ideas y, así, ayudar a que éstas eclosionen.

A Luciana, por dejarme aprender de su perspectiva personal del quehacer académico. Por el tiempo que compartimos en el laboratorio y sus consejos para aprovechar al máximo esta irreplicable experiencia del doctorado.

A Eduardo, por haber confiado y haberme dado libertad en este proceso. Por su generosidad y las oportunidades que me ha dado. Por el acompañamiento en los momentos de distancia y el respaldo en momentos necesarios. Por mostrarme otra cara de la ciencia. ¡Ha sido una gran travesía!

A todos, los abrazo, por haber sido parte de esta historia.

Dedicatoria

A la gente de las comunidades que participó en este trabajo, de diferentes maneras, por su bondad y desinterés en dar y compartir sus perspectivas, a pesar de que uno poco pudiera dar a cambio.

Con el deseo de que el tiempo generosamente brindado y los contenidos de las interacciones habidas, a través de esta tesis y otros productos, en algún momento se traduzcan en un beneficio más directo para ellos.

Esperando este esfuerzo se consolide como un pequeño paso en el enrevesado camino hacia la construcción de realidades más justas.

When we try to pick out anything by itself, we find it hitched to everything else in the Universe.

John Muir

-My First Summer in the Sierra, 1911-

ÍNDICE

RESUMEN	i
ABSTRACT	ii
CAPÍTULO 1. INTRODUCCIÓN	1
1.1. Las Áreas Naturales Protegidas como política pública de conservación	6
1.2. Impacto de las Reservas de Biósfera en las estrategias de vida	7
1.3. Conflictos de conservación y su manejo	10
1.4. Objetivos	12
CAPÍTULO 2. ASPECTOS METODOLÓGICOS	14
2.1. Área de estudio	14
2.2. Comunidades de estudio	16
2.3. Métodos	18
CAPÍTULO 3. EARLY DETECTION OF CONFLICTS FOR THE MANAGEMENT OF PROTECTED AREAS: THE CASE OF CHARCOAL PRODUCTION IN THE LOS PETENES BIOSPHERE RESERVE, MEXICO	20
CAPÍTULO 4. SHARED UNDERSTANDING FOR CONFLICT MANAGEMENT IN CALAKMUL BIOSPHERE RESERVE, MEXICO	33
CAPÍTULO 5. DISCUSIÓN	64
5.1. Obstáculos para el manejo de conflictos	65
5.1.1. La política pública y aspectos institucionales	65
5.1.2. Las perspectivas locales	68
5.2. Coadyuvantes para el manejo de conflictos de conservación	69
5.3. La continua emergencia de conflictos de conservación en reservas de la biósfera	70
5.4. Conclusiones	70
REFERENCIAS	73

RESUMEN

Los conflictos de conservación en áreas naturales protegidas están estrechamente relacionados con la afectación a los medios de vida de las poblaciones locales, especialmente en países del Sur Global. Lograr la conciliación entre bienestar social y conservación continúa siendo un desafío al que muchos factores contribuyen. La necesidad de abordar tal desafío resulta vehemente si consideramos que, por ejemplo, en México, 60% de la superficie de las áreas naturales protegidas se encuentra en comunidades rurales y/o indígenas, dando cuenta de la correlación entre altos niveles de biodiversidad y la presencia de estas poblaciones humanas. A partir del estudio de casos en dos reservas de la biósfera de la Península de Yucatán, las Reservas de la Biósfera Los Petenes (RBLP) y Calakmul (RBC), exploramos los elementos que ayudan o entorpecen el manejo de estos conflictos de conservación. Asimismo, buscamos explicar por qué estas áreas protegidas, a pesar de considerar de manera explícita el involucramiento local, continúan siendo fuente de conflictos de conservación. A partir del análisis de tres conflictos en las RBLP y RBC identificamos que los principales obstáculos para su manejo se relacionan con la política de conservación y el marco institucional a través del que ésta se articula en la práctica, y con las perspectivas de las partes (e.g., administraciones de reservas de la biósfera y poblaciones afectadas). Por otro lado, hallamos sólo dos elementos que contribuyen al manejo de conflictos: el interés compartido por la conservación y la detección temprana de conflictos potenciales. Finalmente, identificamos que la emergencia continua de conflictos de conservación en reservas de la biósfera está asociada tanto a i) la tensión existente entre los intereses de conservación y los intereses de uso de recursos naturales, como a ii) los desafíos de la implementación efectiva de reservas de la biósfera. Si bien la definición de estrategias para el manejo de los conflictos de conservación es altamente contexto-dependiente, identificamos que el planteamiento conjunto de medios de vida alternativos compatibles con las expectativas locales y metas de conservación es un elemento clave para avanzar en el proceso de manejo de conflictos.

ABSTRACT

Conservation conflicts in Protected Areas are deeply linked to impacts on local livelihoods, especially in countries of the Global South. Achieving the reconciliation of social well-being with conservation, remains challenging. A stark example is Mexico, where 60% of protected areas is inhabited by rural or indigenous communities, showing the correlation between high biodiversity levels and the presence of human population. From two case studies in the Yucatan Peninsula, Los Petenes Biosphere Reserve (LPBR) and Calakmul Biosphere Reserve (CBR), we explored the elements that help or hinder conservation conflict management process. We also analyzed why these protected areas, despite explicitly considering local involvement, continue to be sources of conservation conflicts. Drawing from the analysis of three conflicts in LPBR and CBR, we identified that the main obstacles for their management are related to conservation policies and institutional frameworks through which they are implemented, as well as to stakeholders' perspectives. Furthermore, we found only two elements contributing to conflict management: shared interests in conservation and early detection of potential conflicts. Finally, we suggest that the continuous occurrence of conservation conflicts in biosphere reserves is a result of i) the existent tension between conservation interests and natural resource use interests and, ii) the challenges embedded in effective implementation of biosphere reserves. Even when the definition of conflict management strategies is highly context-dependent, we identified that the joint planning and implementation —among reserves' administration and affected populations— of alternative livelihoods matching local expectations and conservation aims, is a key element for advancing the management of conservation conflicts.

CAPÍTULO 1. INTRODUCCIÓN

A nivel global, existe consenso sobre la necesidad de conservación de los recursos naturales y la biodiversidad (Sutherland et al. 2009, OECD 2012, IPBES 2019), lo que constituye uno de los desafíos de la sostenibilidad para el mantenimiento de los sistemas de soporte de vida (Kates 2011, CBD 2011, Martín-López & Montes 2015, ONU 2015, IPBES 2019). La creación de áreas naturales protegidas (ANP) es la estrategia y herramienta institucionalizada más difundida para enfrentar el desafío de la conservación *in situ* (Laurance et al. 2012, Barnosky et al. 2013, Sarukhán et al. 2015, Eklund et al. 2019). Sin embargo, el establecimiento y operación de las ANP puede generar conflictos socioambientales en su entorno de aplicación (Clements et al. 2014, Durand et al. 2015, García-Frapolli et al. 2018). Cuando estos conflictos están asociados a ANP se los denomina conflictos de conservación (*sensu* Redpath et al. 2013). Dada la relevancia y vigencia de las ANP como estrategias de conservación (Godet & Devictor 2018), el abordaje de los conflictos asociados a ellas resulta de gran relevancia en la búsqueda de la efectividad de las áreas protegidas así como de mejores resultados sociales producto de su aplicación.

Desde su conceptualización, la estrategia de ANP ha sido criticada por mantener una perspectiva occidental (Smardon & Faust 2006, Martín-López & Montes 2015), así como por ser parte, en algunos casos (e.g., México), de una política pública centralizada, desvinculada de sus ámbitos específicos de aplicación y de las poblaciones locales. Esta falta de vinculación con los contextos locales ha traído como consecuencia deficiencias de gestión (García-Frapolli et al. 2009, Oliva et al. 2014, Martín-López & Montes 2015) e impactos sociales (Robinson 2011, Clements et al. 2014, Woodhouse et al. 2015). Inicialmente, hacia fines del Siglo XVII y hasta la década de 1970, las ANP perseguían metas de protección estricta, siguiendo 1) la consigna de una mínima presencia humana como pauta para la protección de la biodiversidad (Méndez-Contreras et al. 2008, Martín-López & Montes 2015, Mathevet et al. 2016) y 2) la ausencia de aprovechamiento de

recursos naturales por parte de las poblaciones locales (Smardon & Faust 2006). A partir de la década de 1970, la comunidad científica, los gobiernos y la sociedad civil comenzaron a resaltar el impacto social de las ANP y la necesidad de considerar los derechos y aspiraciones de las poblaciones locales en la conservación, lo que gradualmente se tradujo en la incorporación de objetivos sociales en las estrategias de conservación (Roe 2008, Miller et al. 2011). En la década siguiente, los modelos de ANP pasaron de ser segregativos a adoptar un enfoque integrativo, considerando, además de la conservación, la colaboración y establecimiento de alianzas con los actores locales, así como proyectos de desarrollo para promover el bienestar local (Therville et al. 2018, Karst & Nepal 2019).

La figura de Reserva de la Biósfera (RB) surge en respuesta a este proceso de cambio en la concepción de ANP, con el objeto de abordar el desafío de conciliar la conservación de la biodiversidad con su uso sostenible, promoviendo el desarrollo económico de las comunidades locales y manteniendo sus valores culturales (UNESCO 1996). La evaluación de las prácticas en RB es un tema de interés para las ciencias de la sostenibilidad desde que se creara la figura de estas ANP (Reed 2018). Al igual que a las ciencias de la sostenibilidad, a las RB subyace la premisa de satisfacer las necesidades básicas humanas y al mismo tiempo preservar los sistemas de soporte de vida (UNESCO 1996, Kates et al. 2000). Así, las RB reconocen de manera explícita el involucramiento de los actores locales en las estrategias de conservación, admitiendo el desarrollo de actividades productivas por parte de las poblaciones ubicadas dentro de sus polígonos de acuerdo a una zonificación (i.e., zonas núcleo, zonas de amortiguamiento) o bien, en su zona de influencia (UNESCO 2011).

Sin embargo, a pesar de que las RB permiten el aprovechamiento de recursos naturales, el establecimiento y operación de estas áreas protegidas puede generar un impacto social en las comunidades locales y en sus estrategias de vida (García-Frapolli et al. 2009, Robinson 2011, Clements et al. 2014, Woodhouse et al. 2015), dando origen a conflictos de conservación (Redpath et al. 2013). Estos conflictos pueden implicar 1) la

limitación en el uso de recursos naturales por parte de las poblaciones locales, o 2) la relocalización de estas poblaciones fuera de los límites de las reservas (Redpath et al. 2013, Clements et al. 2014). Los conflictos de conservación emergen cuando dos o más partes (e.g., comunidades locales y administradores de áreas protegidas) mantienen percepciones y perspectivas contrapuestas respecto al uso y conservación de los recursos naturales (Young et al. 2010) y cuando se percibe que una de las partes satisface sus intereses a costa de la otra (Redpath et al. 2013), presentándose un escenario de ilegitimidad asociado a las acciones y medidas de manejo adoptadas.

El manejo de conflictos de conservación, para lo que un abordaje interdisciplinario resulta de gran utilidad, busca la conciliación de los objetivos de conservación con los medios de vida de las poblaciones afectadas, permitiendo la construcción de una relación sostenible entre el medio social y el medio natural (Kates et al. 2000, Redpath et al. 2013). Para esto, se ha señalado que resulta fundamental lograr un entendimiento compartido entre las partes, acerca del conflicto y de las alternativas para su manejo (Redpath et al. 2013). Numerosas disciplinas y técnicas son empleadas para el manejo de conflictos a lo largo del mundo, dependiendo de las características del conflicto, su gravedad y el contexto en que se presenta (Soliku & Schraml 2018). Encontrar los medios adecuados para el abordaje de los conflictos continúa siendo uno de los ámbitos poco explorados, para lo cual es necesario obtener mayor evidencia de los resultados de manejo de diferentes estrategias (Redpath et al. 2013).

El Sureste mexicano presenta una gran riqueza cultural y biológica, que se ha traducido en la creación, desde 1983 hasta la fecha, de nueve RB terrestres y marítimas (CONANP 2018). En el estado de Campeche se encuentran dos de estas áreas protegidas, las Reservas de la Biósfera Los Petenes (RBLP) y Calakmul (RBC), que presentan contextos naturales, culturales e institucionales contrastantes. En la región de Petenes la presencia de la RBLP, a pesar de haber contado con un cierto grado de participación local en el diseño de su programa de manejo (Pat-Fernández & Hernández-Bahena 2004, Pat-Fernández et al. 2006), parecería haber generado un número considerable de conflictos

de conservación, aún poco explorados (e.g., conflictos asociados al aprovechamiento de subsistencia de fauna silvestre; Oliva et al. 2014). Por otro lado, en la RBC, existe un número considerable de conflictos de conservación asociados a la relocalización de comunidades, así como a la restricción de acceso a los recursos naturales (Galindo-Leal 1999, Ericson 2006, Ruiz-Mallén et al. 2015a). En muchos casos, el origen de estos conflictos está asociado al proceso de diseño altamente excluyente de la reserva (Galindo-Leal 1999).

Sirviéndonos de la compatibilidad que existe entre lo que busca el manejo de los conflictos de conservación (i.e., conciliar metas de conservación y medios de vida dignos; Redpath et al. 2013) y el doble objetivo de conservación y desarrollo de las reservas de la biósfera, con este estudio buscamos entender los procesos de manejo de conflictos en este escenario de conservación. Para ello, reconocimos que el enfoque de ciencias de la sostenibilidad ofrecía herramientas útiles para realizar este análisis, en tanto busca la vinculación del conocimiento científico con la atención de problemas de la práctica. En dicha búsqueda, se consideran a) las escalas global (e.g., el incremento de la superficie de ANP contemplado en las metas de Aichi) y local (e.g., impacto de las ANP en las estrategias de vida locales), b) el desafío de satisfacer el bienestar de las generaciones actuales (e.g., subsistencia de poblaciones en el entorno de RB) y generaciones futuras, conservando al mismo tiempo la biodiversidad, c) el involucramiento de los actores en la toma de decisiones que afectan sus vidas y entorno, y d) el diálogo entre los múltiples actores involucrados (Kates et al. 2000, Jerneck et al. 2011). Estos elementos fueron discutidos al analizar los casos de las reservas de Los Petenes y Calakmul, y los conflictos que se presentan con algunas de sus comunidades.

A partir del estudio de conflictos en tres comunidades rurales de la Península de Yucatán, que presentan una gran riqueza en biodiversidad, pero un nivel de marginación alto, se analizaron los procesos de manejo de conflictos de conservación en las RBLP y RBC. Este trabajo de investigación buscó responder las siguientes dos preguntas: 1) ¿cuáles son los principales factores que obstaculizan y que favorecen el manejo de los

conflictos de conservación en comunidades asociadas a las RBLP y RBC?, y 2) ¿por qué, a pesar de contemplar explícitamente objetivos de conservación y desarrollo, las reservas de la biósfera continúan originando conflictos de conservación? La Figura 1 resume el planteamiento del problema de investigación, así como los referentes teóricos que fueron utilizados para abordarlo.

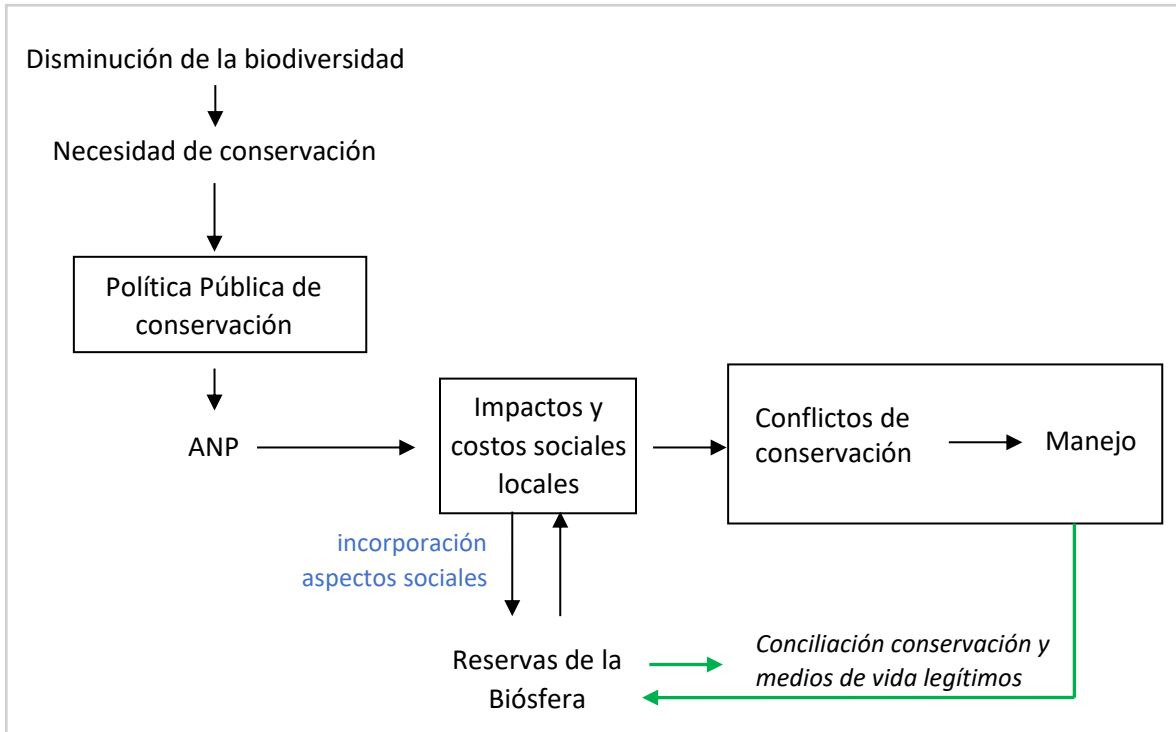


Figura 1. Esquema conceptual del problema de investigación. Partiendo del reconocimiento global sobre una disminución de la biodiversidad, emerge la necesidad de conservar sus componentes, resaltando aquellos recursos bióticos y genéticos críticos para la sostenibilidad humana. Para enfrentar esta problemática, la principal estrategia adoptada a nivel internacional es el establecimiento de áreas naturales protegidas (ANP), que procuran la conservación de la biodiversidad *in situ*, respondiendo a un enfoque proteccionista. A mediados de los 70s, mediante la creación de la figura de Reservas de la Biósfera, se buscó la incorporación de aspectos sociales y culturales al esquema de conservación estricto de los parques naturales. Sin embargo, a pesar de la consideración explícita de las poblaciones locales, las reservas de la biósfera (así como otras ANP) pueden generar un impacto social en estas poblaciones, exigiendo ajustes en sus estrategias de vida y dando origen a conflictos de conservación. El manejo de estos conflictos busca conciliar metas de conservación con medios de vida legítimos de las poblaciones afectadas. Dado su doble

objetivo de conservación y desarrollo, las reservas de la biósfera constituyen un escenario idóneo para estudiar el manejo de este tipo de conflictos.

Dada la relevancia de las ANP como estrategias de conservación (Godet & Devictor 2018), la generación de conflictos asociados a su implementación representa un problema que requiere atención inmediata y creciente para reducir los impactos sociales que generan y lograr la efectividad de esta estrategia de conservación. Esta tesis aporta a dicha necesidad de investigación, que aborda el desafío de integrar metas de conservación de la biodiversidad con el bienestar humano, mismo que ha cobrado relevancia en la política ambiental internacional desde la década de 1990 (UN 1992) y en la actualidad (IPBES 2019). Como resultado de este trabajo se documentan tres conflictos de conservación y sus procesos de manejo. A partir del análisis y discusión de los casos de estudio, se aporta al debate académico internacional y a la política de conservación de ANP en términos de 1) elementos para enriquecer los procesos de negociación entre las partes de los conflictos estudiados, 2) identificación de aspectos clave para el manejo de conflictos de conservación y su contribución en el abordaje del desafío vigente de conciliar la conservación y el bienestar humano, y 3) abundar en la discusión académica sobre la política de conservación mediante ANP y su relación con los conflictos de conservación.

Referentes teóricos para el abordaje del problema de investigación

1.1. Las Áreas Naturales Protegidas como política pública de conservación

Actualmente, existe una tendencia creciente de establecimiento de ANP (CBD 2011, OECD 2012), lo que confirma la aplicación de esta estrategia como una de las principales herramientas para hacer frente a la pérdida de biodiversidad (Sarukhán et al. 2015). El instrumento de política pública de conservación de mayor relevancia a nivel internacional es el Convenio sobre Diversidad Biológica, derivado de la Cumbre de la Tierra de Río de Janeiro en 1992 (CBD 2019). México es signatario de este convenio que, en su Plan Estratégico para la Diversidad Biológica 2011-2020, instituye las metas de Aichi. Entre

ellas, la Meta 11 de Aichi establece el incremento de la superficie de ANP terrestres a un 17% y de ANP marinas a un 10% para el año 2020 (CBD 2011).

En México, la política de conservación de la biodiversidad desde un inicio estuvo marcada por un enfoque antropocéntrico, utilitario y centralista, frecuentemente creándose ANP, incluidas las RB, de manera impositiva (Smardon & Faust 2006, García-Frapolli et al. 2009). Desde este modo de definir y operar la política de conservación, el gobierno federal ha mantenido el control sobre la biodiversidad y los recursos naturales, excluyendo del diseño y manejo de las RB, y otros tipos de ANP, los valores y perspectivas locales en torno al uso de dichos recursos (García-Frapolli et al. 2009, Durand et al. 2015, García-Frapolli 2015, Legorreta-Díaz & Márquez-Rosano 2015). La figura de reservas de la biósfera resulta de particular interés en este contexto, en tanto constituye un tipo de ANP que por definición reconoce el papel de las poblaciones humanas en el mantenimiento de los ecosistemas y la importancia de su participación en el manejo de los mismos (Halfpter 2011). Los administradores de RB, 42 en total en el territorio mexicano (CONANP 2016a & b), se enfrentan así a desafíos operativos que pueden comprometer la efectividad de estas áreas protegidas: por un lado, deben ajustarse a las disposiciones nacionales en cuanto al manejo de RB (que responden a acuerdos internacionales como el Convenio de Diversidad Biológica) y, por otro lado, son los responsables de empatar ese modelo generalista y centralista con las realidades locales del área protegida particular bajo su administración (García-Frapolli et al. 2009). Como se aborda más adelante, el manejo de conflictos de conservación en RB tiene el potencial de constituirse en una vía para acercar la política pública de conservación y los procesos de toma de decisiones con los actores locales, quienes se ven afectados directamente por la ejecución de dicha política (Kates et al. 2000, García-Frapolli 2006).

1.2. Impacto de las Reservas de Biósfera en las estrategias de vida

Aunque la estrategia de RB busca ser incluyente, frecuentemente estas áreas protegidas se establecen de manera impositiva u operan sin el involucramiento de los actores locales,

generando un impacto social en las comunidades locales y en sus estrategias de vida (García-Frapolli et al. 2009, Robinson 2011, Clements et al. 2014, Woodhouse et al. 2015). En México, el 60% del territorio donde se establecen las ANP pertenece a comunidades rurales, muchas de ellas indígenas, donde existe un uso social de los recursos naturales (Smardon & Faust 2006, Clements et al. 2014, Legorreta-Díaz & Márquez-Rosano 2015, Belcher et al. 2015). Por ello, el establecimiento de las ANP implica, en la mayoría de los casos, la pérdida de acceso a recursos naturales de las poblaciones locales, para quienes esos recursos constituyen la base de sus estrategias de vida (Legorreta-Díaz & Márquez-Rosano 2015). Las estrategias de vida son la forma de combinar y usar diferentes recursos (i.e., naturales, sociales, económicos, financieros, físicos e institucionales) para la satisfacción de las necesidades de una población (Scoones 1998, DFID 1999).

De la mano con la creación de las RB, se establecen las regulaciones de los recursos naturales que las reservas resguardan. Siguiendo una zonificación, las RB permiten actividades de aprovechamiento en sus zonas de amortiguamiento, mientras que prohíben actividades productivas o recreativas dentro de su zona núcleo, considerada de protección estricta (UNESCO 1996). Como consecuencia de este tipo de restricciones en el acceso a recursos naturales, las poblaciones locales se ven en la necesidad de ajustar sus estrategias de vida a un nuevo marco y conjunto de reglas institucionales (i.e., programas de manejo de las reservas) (Oliva et al. 2014).

Es importante resaltar que las RB deben proveer los medios para el desarrollo de actividades económicas que sustituyan los ingresos de las poblaciones locales en caso de que vean restringidas o prohibidas sus actividades dentro de la reserva (UNESCO 1996). A pesar de estas consideraciones, es común que las administraciones de estas áreas protegidas no consideren de manera adecuada los medios necesarios para que la población local desarrolle estrategias de vida alternativas (Bennett & Dearden 2014), lo que deriva en la asunción local de los costos de conservación (Legorreta-Díaz & Márquez-Rosano 2015).

A este respecto, se ha reconocido que los costos y beneficios asociados a las RB pueden distribuirse de manera desigual entre los diferentes actores sociales (Miller 2013, Dower 2015, Legorreta-Díaz & Márquez-Rosano 2015, Anderson et al. 2016). Por ejemplo, en la práctica de la política de conservación mexicana, se dedican esfuerzos a hacer cumplir las restricciones de uso de recursos naturales que las RB traen consigo, mientras que no ocurre lo mismo con el compromiso de generar mecanismos para promover el bienestar local y compensar los costos de conservación asumidos localmente (Legorreta-Díaz & Márquez-Rosano 2015).

Por otra parte, el carácter excluyente del diseño, establecimiento y operación de las RB mina la disposición de las poblaciones locales a colaborar en la consecución de objetivos de conservación (Mathevet et al. 2016). Ante esto, se busca involucrar a los actores locales mediante procesos de participación, bajo la premisa de que los esfuerzos de conservación tienen más probabilidades de ser exitosos a largo plazo si involucran a las poblaciones locales y proveen oportunidades para mejorar su bienestar económico (Millennium Ecosystem Assessment 2005, Reed 2008, McShane et al. 2011, Wright et al. 2016). Ejemplo de ellos son algunas de las concesiones forestales en la Reserva de la Biósfera Maya, Guatemala, donde Radachowsky y colaboradores (2012) encontraron mejores valores de conservación (i.e., menor incidencia de incendios, menor tasa de cambio de uso de suelo) en áreas sujetas a aprovechamiento que fuera de la reserva.

Se esperaría que la particularidad de las RB de reconocer de manera explícita el involucramiento de los actores locales en la conservación (UNESCO 1996), contribuyera a alinear los intereses de los diferentes actores implicados y a generar logros más sistemáticos en los objetivos de conservación, así como un menor impacto en las estrategias de vida locales por la creación de estas reservas (Pimbert & Pretty 1995). Sin embargo, es posible que la continua emergencia de conflictos asociados a reservas de la biósfera esté relacionada con atributos propios de esta estrategia de conservación o con su forma de implementación (e.g., desvinculación de los actores locales).

1.3. Conflictos de conservación y su manejo

Los procesos de imposición y operación excluyente de áreas protegidas, la falta de consideración de actores locales y sus intereses, los procesos de participación inefectivos, las diferencias de poder en los procesos de negociación para conciliar diferencias y llegar a acuerdos entre las partes, la afectación de los medios de vida locales por las regulaciones de áreas protegidas, son algunas de las causas detrás de la emergencia de los conflictos de conservación (Clements et al. 2014, Durand et al. 2015, Redpath et al. 2015). En términos más generales, estas disputas surgen porque las partes (e.g., poblaciones locales, administradores de ANP) mantienen opiniones opuestas sobre objetivos de conservación (Redpath et al. 2013), o cuando una parte percibe un agravio o menoscabo en su bienestar, medios de vida o derechos a raíz del comportamiento o accionar de la otra parte (de Pourcq et al. 2015). En estos casos, el conflicto puede generarse por la relocalización de poblaciones, o por la restricción de su acceso a recursos naturales (Robinson 2011, Redpath et al. 2013). La emergencia de conflictos de conservación está asociada a relaciones de poder, cuando los objetivos de conservación son impuestos a otros (e.g., poblaciones locales excluidas de áreas protegidas) y a los diferentes valores de los actores (i.e., deseos, necesidades, intereses, ideales, y aspiraciones). Reconocer los distintos valores de las partes en un conflicto es relevante en tanto esto puede implicar un entendimiento diferente entre las partes acerca de la conservación, de los recursos naturales y del conflicto mismo (Redpath et al. 2013, Holland 2015).

El manejo de los conflictos de conservación busca abordar el desafío de conciliar la conservación con los medios de vida de las poblaciones humanas (Redpath et al. 2013, Woodhouse et al. 2015). Cuando los conflictos no se manejan de manera efectiva, entorpecen la sostenibilidad, en tanto obstaculizan el desarrollo económico, la equidad social y la sostenibilidad de los recursos naturales (Redpath et al. 2013). Por otro lado, se considera que un conflicto es manejado de manera exitosa o efectiva cuando el resultado es aceptable para las partes, y ninguna de ellas percibe que la otra está satisfaciendo sus intereses a costa de la otra. Cabe mencionar que mejores resultados del manejo de

conflictos no necesariamente implican mejores resultados de conservación de la biodiversidad. Uno de los principales elementos para el manejo de los conflictos es que las partes los perciban como un problema compartido, en el que la cooperación puede llevarlos a una estrategia de manejo con resultados favorables para ambos (Redpath et al. 2013, Mathevet et al. 2016).

Por lo anterior, entre las pautas para un adecuado manejo de los conflictos de conservación, se propone la participación efectiva y el involucramiento de las partes, así como la consideración de los valores de todos los actores implicados (Reed 2008, Redpath et al. 2013, Bennett & Dearden 2014, Elston et al. 2014). El estudio de factores socioculturales resulta de gran importancia, ya que las estructuras sociales y percepciones locales influyen en los comportamientos y actitudes hacia la conservación (Waylen et al. 2013, Woodhouse et al. 2015), consideración fundamental para que las decisiones de manejo y conservación sean perdurables en el tiempo (Reed 2008, Young et al. 2013). Así, el manejo de los conflictos de conservación enfatiza el involucramiento de los actores locales, reconocido como elemento fundamental para el éxito de las estrategias de conservación (Reed 2008, Salafsky 2011, Sarkar & Montoya 2011, Young et al. 2013). En el caso de México, esto representa un desafío dado que la política nacional de conservación enfrenta serios obstáculos para lograr la incorporación efectiva de las poblaciones locales en el manejo de las ANP (Smardon & Faust 2006, García-Frapolli et al. 2009).

Redpath y colaboradores (2013) proponen una guía con dos etapas para el estudio de los conflictos de conservación: a) el mapeo y b) el manejo del conflicto. En la primera etapa se busca mapear el conflicto a partir de la identificación de variables sociales (e.g., identificar los actores involucrados y sus posiciones, reconocer los impactos sociales del conflicto, entre otros) y variables ecológicas (e.g., impactos ecológicos), así como el contexto sociopolítico del conflicto. La segunda etapa, concentrada en el manejo del conflicto, se centra en los procesos de búsqueda y generación de soluciones alternativas. De esta forma, la guía para el mapeo y manejo de conflictos permite articular distintas disciplinas (i.e., de las ciencias sociales y naturales) así como orientar el estudio de

problemas prácticos a la búsqueda de soluciones. En este proceso de manejo (i.e., búsqueda de soluciones) se vincula el conocimiento generado con las acciones requeridas para atender los conflictos (Miller 2013).

Las RB, por su consideración explícita de objetivos de desarrollo socioeconómico local, representan el escenario idóneo para estudiar el manejo de los conflictos de conservación de que son parte. Esto último, debido a que se esperaría que las reservas de la biósfera establezcan estrategias para paliar los impactos sociales generados (e.g., promoviendo actividades productivas alternativas y la apertura de espacios de participación efectiva), constituyendo acciones para el manejo de los conflictos.

1.4. Objetivos

Objetivo general:

Analizar los procesos de manejo de conflictos de conservación en las Reservas de la Biósfera Los Petenes y Calakmul, identificando elementos que contribuyan a proveer las bases para la coexistencia de metas de conservación y medios de vida locales.

Objetivos particulares:

1. Mapear tres conflictos de conservación en comunidades ubicadas en los ámbitos de las dos reservas
2. Explorar los procesos de manejo de los conflictos de estudio desde la perspectiva de las partes involucradas
3. Determinar cuáles han sido los aspectos y procesos claves en el manejo de los conflictos de conservación estudiados

A continuación, en el capítulo 2 se presentan los Aspectos Metodológicos, donde se describe el área de estudio y los métodos empleados para la colecta de datos y análisis de la información. En los capítulos 3 y 4 se presentan los resultados de los casos de estudio en la RBLP y RBC, respectivamente. Los tres objetivos específicos de esta tesis son abordados en estos dos capítulos. En el capítulo 3, se presenta el caso de la producción de carbón vegetal como un conflicto potencial entre la comunidad de Los Petenes y la RBLP, y se analizan los obstáculos que la legislación actual impone para encontrar una solución que satisfaga los intereses de ambas partes. En el capítulo 4, se analiza el papel del entendimiento compartido entre las partes para el manejo de dos conflictos de conservación asociados a aspectos territoriales en la RBC, y se identifican otros elementos relevantes para los procesos de búsqueda de soluciones a los conflictos. Finalmente, en el capítulo 5 (Discusión), se retoman los principales hallazgos de los tres casos de estudio para discutirlos en términos de las preguntas de investigación de este trabajo.

CAPÍTULO 2. ASPECTOS METODOLÓGICOS

2.1. Área de estudio

El área de estudio comprende las RBLP y RBC junto con sus zonas de influencia, ambas reservas ubicadas en el Estado de Campeche, en la Península de Yucatán, México (Fig. 2). La RBLP se decretó en 1999, con 282,857 ha (64% marina, 36% terrestre). El clima de la región es cálido subhúmedo, con una temperatura media mensual de 26°C y una precipitación media anual de 819 mm (Yañez-Arancibia 1996). En la reserva se presenta principalmente selva mediana subperennifolia, manglar, matorral xerófilo y pastizal (Flores & Espejel 1994). Se destaca la presencia de islas de vegetación arbórea (selva-manglar) o petenes, inmersos en terrenos cubiertos, en su mayoría, por pastizal natural (e.g., *Typha dominguensis* y *Cladium jamaicense*) y elementos dispersos de selva y manglar (estructuralmente más bajos que los encontrados en petenes) (Mas & Correa-Sandoval 2000, Montiel et al. 2006). El humedal costero de la reserva cuenta con el reconocimiento internacional de Sitio Ramsar (2004). La RBLP no tiene poblaciones en su interior, encontrándose todas ellas en la zona de influencia. Se trata de una zona con población maya, donde las actividades de subsistencia (e.g., agricultura de temporal, cacería) están marcadas por un fuerte arraigo sociocultural (CONANP 2006).

Por su parte, la RBC se decretó en 1989, con una superficie total de 723,185 ha (CONANP 1999, Galindo-Leal 1999). Constituye el relicto de selva tropical más grande de México (CONANP 1999), y cuenta con la denominación internacional de Patrimonio Mixto de la Humanidad (UNESCO 2014), en reconocimiento a sus atributos culturales y naturales. El clima en la región de Calakmul es cálido subhúmedo, con una temperatura media mensual de 26.2 °C y una precipitación media anual de 1,223 mm (Porter-Bolland et al. 2006). Las condiciones geológicas, climáticas, edáficas y de vegetación de la región ofrecen un ambiente que permite el desarrollo de selvas altas y medianas, así como selvas bajas temporalmente inundables (CONANP 1999). De acuerdo con diversas

investigaciones (Galindo-Leal 1999, Ruiz-Mallén et al. 2015b), en la creación de la RBC no se tomó en cuenta a la población local. Desde su creación, esta reserva cuenta con poblaciones en su interior, incluso en su zona núcleo. Aunque es común que las reservas se establezcan en áreas previamente habitadas, en el caso particular de la RBC, se desconocían las condiciones sociales del sitio al momento del decreto (i.e., proceso de colonización en marcha). La falta de participación de las comunidades en los procesos de planeación y toma de decisiones de la RBC han sido causa de conflictos de conservación en esta área protegida desde un inicio (Galindo-Leal 1999, Haenn 1999, Ericson 2006, Sosa-Montes et al. 2012, Porter-Bolland et al. 2013), reflejados en la relocalización de comunidades (e.g., Unión 20 de Junio, El Sacrificio) y en la restricción de actividades de subsistencia, especialmente en las comunidades que están dentro del polígono de la reserva.

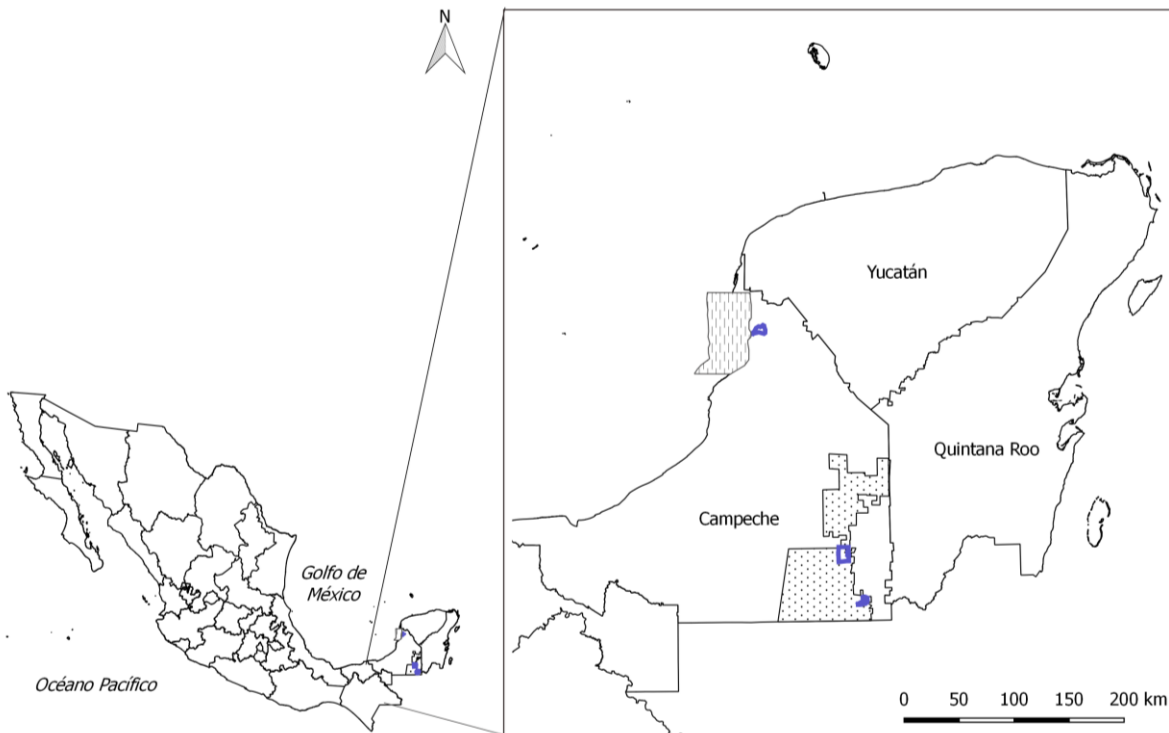


Figura 2. Área de estudio, en la Península de Yucatán. Se muestran las Reservas de la Biósfera Los Petenes (área con líneas verticales) y Reserva de la Biósfera Calakmul (área con puntos) así como las comunidades de estudio (líneas continuas en azul). Fuente: elaboración propia.

2.2. Comunidades de estudio

Se seleccionaron tres comunidades de estudio: Los Petenes (siguiendo la referencia de lugar¹ empleada por León & Montiel 2008), en el municipio de Hecelchakán, en la zona de influencia de la RBLP, y Centauro del Norte y El Sacrificio, ambas en el municipio de Calakmul y dentro de la RBC (Fig. 2). Estas tres comunidades representan conflictos con diferentes características de interés para abordar el objetivo general de este trabajo, dadas las particularidades de cada problemática y los procesos de manejo del conflicto en cada caso. La información acerca de estos conflictos en la zona de estudio está escasa o nulamente documentada.

Los Petenes es un ejido con población maya yucateca (Tabla 1) donde se practican actividades tradicionales de subsistencia como la agricultura de temporal y la cacería, y donde la producción de carbón vegetal es la principal actividad generadora de ingresos. Esta práctica artesanal se realiza desde hace al menos dos generaciones. Si bien el aprovechamiento de madera y la producción de carbón se llevan a cabo en terrenos ejidales, existe una preocupación por parte de las autoridades de la RBLP acerca de la intensidad de la actividad, que podría estar superando las tasas de regeneración de la vegetación, motivando a los productores a buscar nuevas áreas de explotación. Dada la cercanía con la reserva, sus autoridades temen el ingreso de los productores de carbón al área de la reserva para extraer madera, planteando el escenario de un conflicto potencial.

Por su parte, tanto Centauro del Norte como El Sacrificio tienen parte de sus polígonos dentro de la RBC. En ambos casos, estas poblaciones se formaron por la migración de familias que salieron en busca de tierras desde otros estados del país (principalmente Chiapas, Veracruz y Tabasco en el caso de Centauro del Norte, y Chiapas y Campeche en el caso de El Sacrificio). Centauro del Norte es un Nuevo Centro de Población Ejidal, sin presencia indígena, donde se practican actividades tradicionales de

¹ Se utiliza el nombre de “Los Petenes” para este caso de trabajo con el fin de tener consistencia con los estudios previos en la zona y para preservar la identidad de la comunidad dado el carácter legalmente comprometido de la producción de carbón, actividad analizada en el caso de estudio.

subsistencia, además de la apicultura, de gran relevancia para la economía local. Este ejido presentó y ganó, en 1992, una demanda de amparo por la cual la comunidad quedó exenta de las regulaciones de la reserva. A pesar de ello, la comunidad parecería continuar viviendo restricciones por parte de la RBC. El Sacrificio es una comunidad conformada por pequeñas propiedades sin titular (i.e., los habitantes no cuentan con títulos de propiedad ni otro documento que respalde la legal tenencia de la tierra), ubicada al sur del municipio de Calakmul; allí también se practican actividades de subsistencia como la agricultura de temporal y la cacería, y destaca la escasez de alternativas para la generación de ingresos, más allá de la producción de chile jalapeño durante dos meses del año. El caso de El Sacrificio se trata del desplazamiento de cuatro comunidades (i.e., 22 de Abril, Las Delicias, Aguas Amargas y Aguas Turbias) que estaban dentro de la reserva y fueron reubicadas en un asentamiento llamado Santo Domingo (dando lugar así a la creación de El Sacrificio). A pesar de que el desplazamiento se dio para evitar la superposición con la reserva, tras la relocalización, en 1999, el polígono de la comunidad quedó nuevamente dentro de la reserva, lo que ha impedido la titulación de las tierras, trayendo además restricciones de uso de recursos naturales.

Tabla 1. Principales características socio-territoriales de las comunidades de estudio.

Atributo	Comunidad		
	Centauro del Norte	El Sacrificio	Los Petenes
Año de creación	1987	1999	1997
Población	236 habitantes Sin presencia indígena	540 habitantes Grupos indígenas: chol, tzeltal y tzotzil	885 habitantes Grupos indígenas: maya yucateco
Régimen de tenencia de la tierra	Nuevo Centro de Población Ejidal	Pequeña propiedad	Ejido
Ejidatarios/propietarios	67 ejidatarios	99 propietarios	104 ejidatarios
Superficie	10,024 ha, de las que: 2,640 ha en zona núcleo de la	2,160 ha, de las que: 215 ha en zona núcleo	5,811 ha, todas fuera de la RBLP

RBC	de la RBC (12 predios)
7,384 ha en zona de amortiguamiento de la RBC	1,024 ha en zona de amortiguamiento de la RBC (52 predios)

2.3. Métodos

Esta investigación corresponde al tipo observacional, con tres estudios de caso (Newing 2011), uno en la Reserva de la Biósfera Los Petenes y dos en la Reserva de la Biósfera Calakmul. El objetivo de estos estudios de caso fue describir a profundidad y entender las variables que han incidido y afectan actualmente los conflictos de conservación en las tres comunidades de estudio, así como el manejo de los mismos. La selección de casos en dos reservas nos permitió analizar aspectos de la emergencia y manejo de los conflictos de conservación en contextos diferentes (i.e., en términos culturales, ecológicos, de su historia y administración) y, a partir de ello, aportar elementos que contribuyan tanto al abordaje de los conflictos particulares estudiados y al manejo de estas reservas, así como a la discusión académica sobre el tema. Por otra parte, los tres casos se seleccionaron en función de criterios prácticos, como la factibilidad de trabajar en las comunidades (i.e., experiencia previa en Los Petenes, y recomendaciones de actores clave en Centauro del Norte y El Sacrificio), así como por aspectos teóricos asociados a la relevancia y carácter simbólico de los conflictos referida por actores clave de ambas regiones (i.e., los directores de las reservas y, especialmente en Calakmul, practicantes de la conservación y promotores de desarrollo local pertenecientes a organizaciones de la sociedad civil con prolongada presencia en la zona).

La colecta de datos se llevó a cabo mediante entrevistas semiestructuradas a jefes y jefas de familia en las comunidades de estudio, entrevistas a profundidad a actores clave pertenecientes a las comunidades y fuera de ellas (i.e., autoridades gubernamentales y actores clave asociados al manejo de los conflictos estudiados). Se llevó a cabo observación participante y no participante en las comunidades de estudio durante las

estancias en ellas. Para el análisis de la información, se aplicó estadística descriptiva y pruebas estadísticas no paramétricas, además de métodos cualitativos para el mapeo de los conflictos, siguiendo la guía para el manejo de conflictos propuesta por Redpath y colaboradores (2013). Información más detallada sobre la colecta y análisis de datos en cada caso de estudio se presenta en los capítulos 3 para Los Petenes y 4 para Centauro del Norte y El Sacrificio.

CAPÍTULO 3. EARLY DETECTION OF CONFLICTS FOR THE MANAGEMENT OF PROTECTED AREAS: THE CASE OF CHARCOAL PRODUCTION IN THE LOS PETENES BIOSPHERE RESERVE, MEXICO

Oliva, M., García-Frapolli, E., Porter-Bolland, L. y Montiel, S. 2019. Early Detection of Conflicts for the Management of Protected Areas: The Case of Charcoal Production in the Los Petenes Biosphere Reserve, Mexico. *Environmental Management* 64:52–63.



Early Detection of Conflicts for the Management of Protected Areas: The Case of Charcoal Production in the Los Petenes Biosphere Reserve, Mexico

Malena Oliva¹ · Eduardo García-Frapolli¹ · Luciana Porter-Bolland² · Salvador Montiel³

Received: 3 October 2018 / Accepted: 27 April 2019 / Published online: 11 May 2019
© Springer Science+Business Media, LLC, part of Springer Nature 2019

Abstract

Management of conservation conflicts is a challenge of growing relevance for the effectiveness of protected areas worldwide, particularly in the case of socially inclusive areas such as biosphere reserves. For a successful management of the protected area, is critical to consider the social use of natural resources carried out by local populations linked to reserves, especially in socio-ecological contexts facing potential conservation conflicts (i.e., conflicts that have not yet arisen). We addressed the importance of an early detection of potential conflicts through the study of artisanal charcoal production by Yucatec Mayan communities located in the zone of influence of a biosphere reserve in Northwest Yucatan Peninsula, Mexico. Through semi-structured interviews with charcoal producers and in-depth interviews with environmental authorities linked to the reserve, we discuss the advantages associated to early detection of potential conservation conflicts for biosphere reserves' management.

Keywords Potential conservation conflicts · Protected areas · Forest management · Stakeholders engagement

Introduction

Conflicts are an inherent element in the establishment and management of protected areas (PAs) (Lewis 1996; De Pourcq et al. 2017). Deciding how and where to put conservation into practice has put conservation institutions, whether governmental or not, in confrontation with local populations (García-Frapolli et al. 2018). Conflicts in PAs arise because of a clash of interests between different

stakeholders (e.g., PA administration, local populations) regarding the use of natural resources, and because one of the parties imposes its position over the interests of the other (Redpath et al. 2013). Addressing conservation conflicts is crucial for the effective management of PAs (Carmen et al. 2015). On a global level, the occurrence of this type of conflict is widely documented, and an incipient bibliography exists that analyzes the different strategies for managing and solving them (Baynham-Herd et al. 2018; García-Frapolli et al. 2018; Soliku and Schraml 2018a). Nevertheless, little emphasis has been given to the importance of anticipating the detonation or the escalation of these conservation conflicts.

As has been widely documented, the use of natural resources in PAs contributes to the livelihoods of many local populations located inside and outside the areas under protection (Anaya and Espírito-Santo 2018; García-Frapolli et al. 2009). The overlap of conservation areas and local populations who make social use of natural resources is a scenario that favors the emergence of conservation conflicts, since local interests regarding the use of natural resources can diverge from the conservation interests of a PA (Redpath et al. 2013). Thus, the establishment and operation of a PA inherently entails potential conservation conflicts.

✉ Eduardo García-Frapolli
garcia.frapolli@gmail.com

¹ Instituto de Investigaciones en Ecosistemas y Sustentabilidad, Universidad Nacional Autónoma de México, Antigua carretera a Pátzcuaro No. 8701, Col. San José de la Huerta, Morelia 58190 Michoacán, Mexico

² Red de Ecología Funcional, Instituto de Ecología, A. C., El Haya, Xalapa, Veracruz 91070, Mexico

³ Departamento de Ecología Humana, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN), Unidad Mérida, México, Km. 6 antigua carretera a Progreso, Mérida, Yucatán 97310, Mexico

Because of the social use of ecosystems occurring within the context of PAs, management of conservation conflicts should focus on reconciling local livelihood strategies with conservation goals (Redpath et al. 2013). Biosphere reserves, which hold the dual objective of conservation and socio-economic development (UNESCO 2014), could be seen as a PA model for facing this conservation challenge and its associated conflicts, particularly in regions where various extractive practices contribute to local livelihoods (Oliva and Montiel 2016).

Biosphere reserves explicitly consider the involvement of the human population and their socioeconomic development as part of their conservation strategy (Halffter 2011). Nevertheless, although these reserves allow natural resource use by local populations in accordance with specific zones (e.g., buffer and core zones; UNESCO 1996), it has been seen over the years that they face different obstacles in achieving their conservation and development goals. Among these are difficulties in achieving effective social participation and adequate management implementation, as well as a lack of financial and human resources for their operation (Cooper and Kainer 2018; Lu et al. 2012; Van Cuong et al. 2017). These findings have shown that conservation conflicts are an additional obstacle for effective management of biosphere reserves.

Redpath et al. (2013) identified two particularly relevant stages for conducting effective conflict management in the context of PAs: mapping (i.e., understanding and description), and the management of the conflict. Figure 1b indicates aspects related to the description and understanding of a conflict, and its management. It begins with the definition and identification of stakeholders (and their perspectives), as well as the characterization of the sociopolitical context and the collection of evidence (social and ecological) regarding the conflict and its impact. In a subsequent stage, if a willingness between the parties to engage in a dialogue exists, they proceed to seek consensus in designing alternatives for conflict management. In this paper, we propose the incorporation of an initial stage (Fig. 1a) within this management model. The initial stage proposes the early identification of a potential conservation conflict, when an interaction of different interests (e.g., extraction versus protection) occurs between the local population and conservation authorities. We argue that the early detection of a potential conservation conflict could improve its management, for instance by encouraging the early engagement of stakeholders in the management process.

To illustrate our proposal for identifying potential conservation conflicts, we address the case of artisanal charcoal production in the setting of the Los Petenes Biosphere Reserve (LPBR), located in the Northwest Yucatan Peninsula,

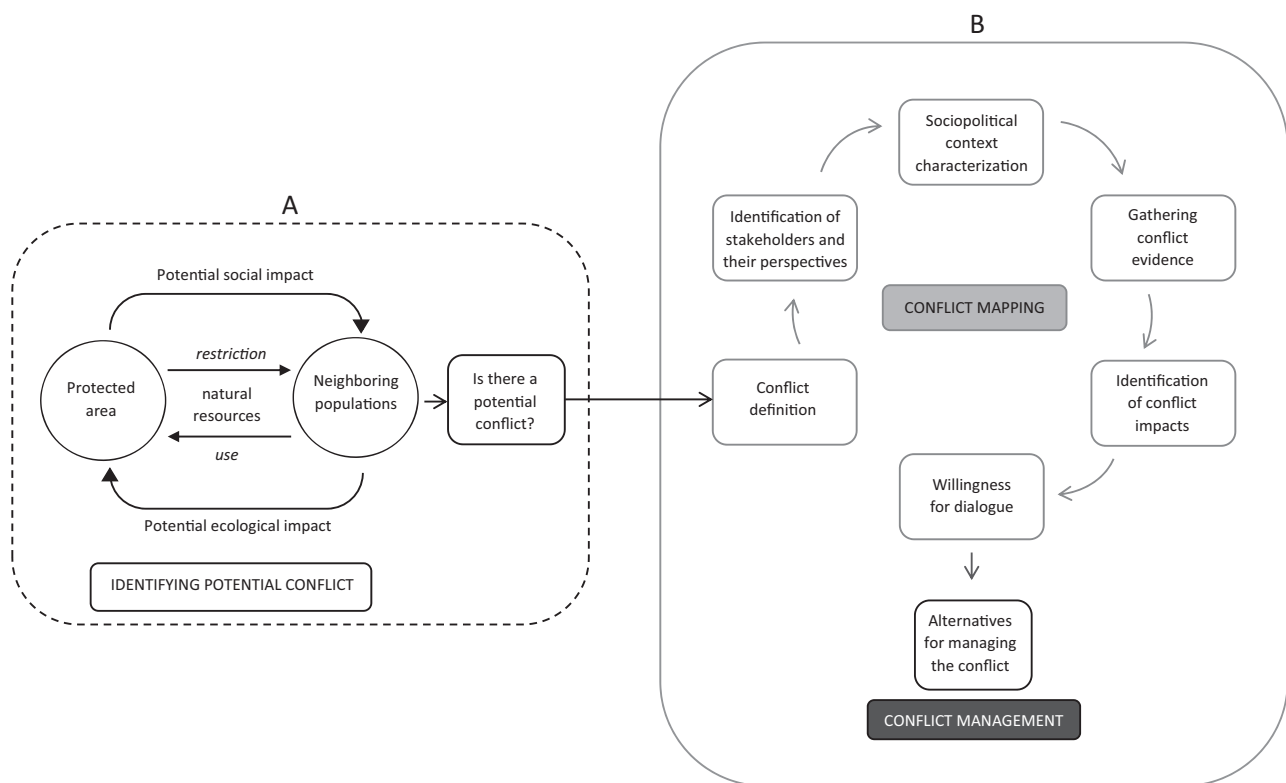


Fig. 1 Stages for approaching conservation conflicts

Mexico. The LPBR, unlike other reserves in the region, has no human settlements in its terrestrial area (36% of the PA). Nevertheless, as part of its zone of influence (ca. 1125 km² along the reserve's eastern border) there are at least 20 Yucatec Maya communities that have historically reproduced the multiple natural resource use strategy characteristics of the Yucatec Maya culture (Barrera-Bassols and Toledo 2005; Oliva et al. 2014). One of the activities shaping the livelihoods of inhabitants living near the LPBR, which is of great relevance to their household economy, is the artisanal production of charcoal through “earth kilns.” This is the oldest and most rudimentary traditional technique for charcoal production (Wolf and Vogel 1985), which involves the processing of firewood obtained from agricultural plots or communal forests (CONANP 2006; León and Montiel 2008).

In this context, a situation of potential conflict between the LPBR's authorities and the charcoal producing communities is revealed, because (1) a potential ecological impact exists from charcoal production in areas neighboring the LPBR (e.g., exceeding the natural regeneration rate of the forest), with the possible spreading of this ecological effect to the interior of the LPBR, and because (2) charcoal production is of great relevance for local livelihoods. We define this situation as a potential conservation conflict (i.e., it has not yet emerged), because there is still no direct dispute regarding the use of the natural resource (in this case the forest) among the involved parties. If the firewood used to produce the charcoal were to be extracted within the LPBR, a current concern of the PA administration, it would create a clash of interests between the LPBR and the local charcoal producers regarding the use and conservation of the forest, which would lead to the emergence of a conservation conflict. We argue that the potential character of such a conflict provides the opportunity for intervening in its anticipated management and, thus, offering the possibility of avoiding social and ecological impacts. Similarly, the anticipation of negative impacts could translate into a more effective management of the biosphere reserve.

Using this case study on charcoal production in the LPBR's zone of influence, in this paper we explore the opportunities for the early detection of conservation conflicts. In addition, we analyze the challenges that arise regarding the management of this conflict, and we conclude by emphasizing the advantages that the early detection of potential conflicts represents for the management of biosphere reserves.

Methods

Study Area

The study area covers the domain of the LPBR, located in the state of Campeche, in the Yucatan Peninsula (Fig. 2).

This reserve was decreed in 1999, and covers 282,857 ha (64% marine, 36% terrestrial) (CONANP 2006). The reserve's predominant vegetation is called *petenes*, composed of medium sub-deciduous forest and mangroves that develop naturally on slightly elevated ground in a matrix of natural grassland (Flores and Espejel 1994). The coastal wetland that it hosts has had Ramsar site recognition since 2004. The communities neighboring the LPBR are Yucatec Maya, whose subsistence activities (e.g., seasonal agriculture, hunting) are marked by strong sociocultural roots (CONANP 2006; Rodríguez et al. 2012).

In particular, charcoal production is of great importance in various communities near the LPBR. One of these communities is Los Petenes (community reference used by Rodríguez et al. 2012), which has 885 inhabitants, mostly Yucatec Maya, and has a high degree of marginalization (INEGI 2010). The landholding system is communal, called *ejido*, which is a form of land tenure that emerged as an outcome of the land redistribution and restitution policies following the Mexican Revolution. Decisions regarding the use of the land are taken by *ejidal* assembly, comprised exclusively of *ejidatarios* (Haenn 2006). Los Petenes is endowed with 5811 ha (INEGI 1997) located in the LPBR's zone of influence. The communal land is divided into individual work areas called plots (*parcelas*) of 50 ha each. In these plots, local producers obtain the raw material for charcoal production, and build the earth kilns. There is also a portion of land that is not distributed among *ejidatarios* but remains as common land. On occasion, common land is used collectively for conservation or productive projects (e.g., payment for ecosystem services).

In Los Petenes, charcoal production has been practiced for at least two generations. The production technology is artisanal, by making earth kilns which are built on the sites where firewood is obtained. Fifteen species are used for charcoal production, the most common being *jabín* (*Piscidia communis*), *kitinché* (*Lonchocarpus rugosus*), *tzalam* (*Lysiloma bahamensis*), *dzidzilché* (*Ginnopodium floribondum*) and *chukun* (*Phytocellobium albicans*). No infrastructure is required, since the kilns are built by stacking the firewood, which is then covered with graminoids (e.g., *Cladium jamaicense*) and soil obtained from the surroundings. The firewood is obtained by the complete felling of an area (a method known as *matarrasa* felling), a practice that consists of extracting all the arboreal individuals in a given area.

Data Collection and Fieldwork

Thirty-six semi-structured interviews were undertaken with charcoal producers, landowners or *ejidatarios*, and those without land rights or *pobladores*. We interviewed 82% of inhabitants engaged in charcoal production to obtain

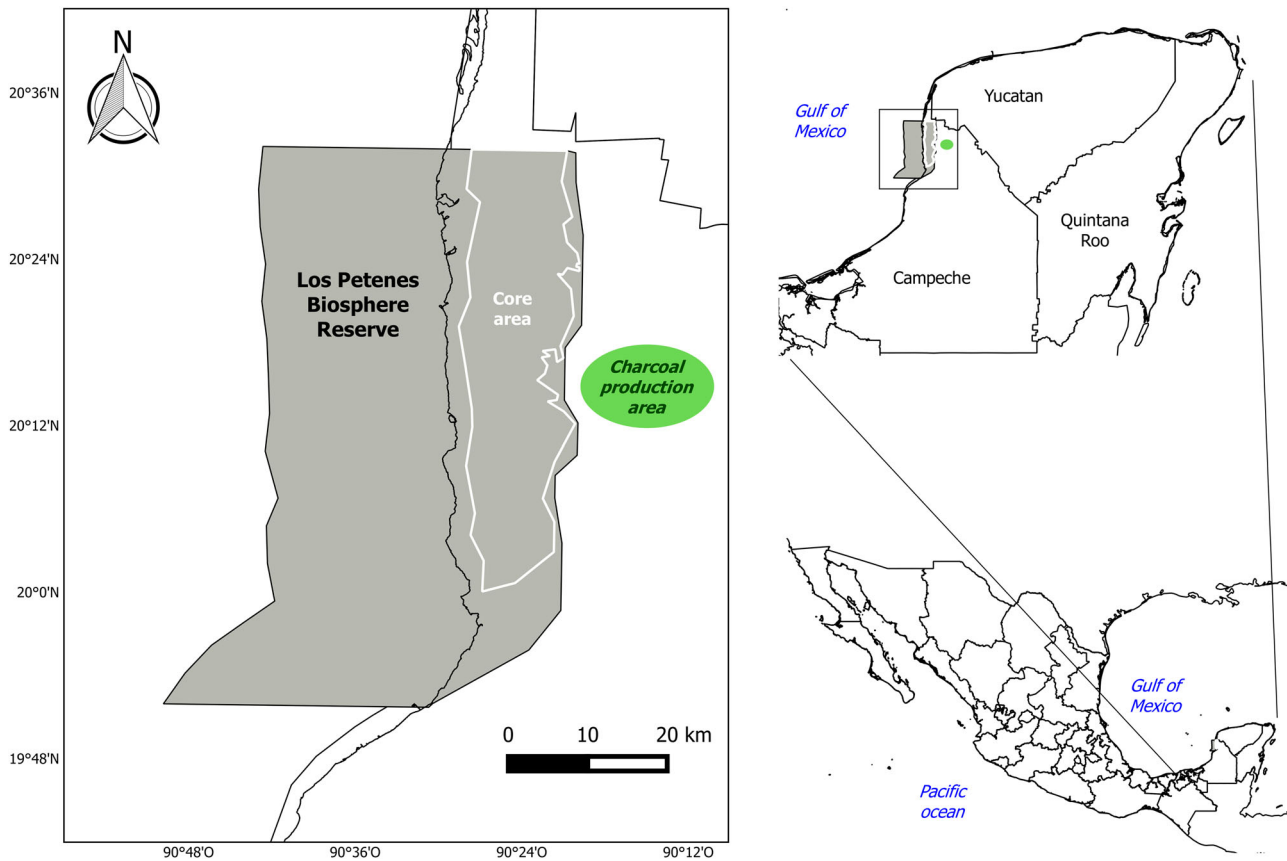


Fig. 2 Study area location in the northwest of the Yucatan Peninsula. Los Petenes Biosphere Reserve (LPBR) is denoted by the gray area, with its core area delineated in white. The area of charcoal production (green oval) is located in the LPBR's zone of influence

information regarding the following: (a) charcoal production activity, (b) impact of the reserve's regulations and the legal framework on the activity's development, and (c) local perceptions and perspectives regarding the productive activity and the potential conflict with the reserve's authorities. In the community, the interviewees were selected using the snowball method (Newing 2011), starting with two key informants who helped identify the other charcoal producers.

In addition, semi-structured interviews were performed with the community authorities, addressing the following themes: (a) the community's relationship with the reserve, (b) the community's participation in the Technical Advisory Committee of the LPBR (liaison entity between the biosphere reserve authorities and the local populations), and (c) opinions about the current charcoal production situation in relation to forestry official permits and the enforcement authorities (the Secretary of the Environment and Natural Resources [SEMARNAT] and the Federal Attorney of Environmental Protection [PROFEPA]). Similarly, an in-depth interview was undertaken with the director of a local non-governmental organization (NGO), who is fostering an alternative program of forest management (the Plot Management Program [PMP]).

We performed participant and nonparticipant observation to complement and triangulate the information obtained with the information from the interviews with the charcoal producers. This observation offered useful data for describing the productive and organizational context in the community, as well as the attitudes and perceptions regarding the environmental authorities—mainly SEMARNAT and PROFEPA.

To obtain the official perspective of potential conflict, an in-depth interview was undertaken with the director of the LPBR, asking for: (a) his perspective regarding charcoal production issues in the reserve's zone of influence, (b) the strategies that have been implemented or are currently being developed to address the issues associated with charcoal production, and (c) the limitations and advantages identified for this conflict's resolution. In addition, the head of the Natural Resources Use and Regeneration Unit of the SEMARNAT (henceforth SEMARNAT) was interviewed. This unit is responsible for awarding the permits for charcoal production. In this case, we sought to understand the procedures and requisites for the aforementioned activity, as well as to evaluate the legal feasibility of the PMP proposal.

Data Analysis

Following the method of Redpath et al. (2013), we approached the conservation conflict through its mapping, considering the following variables: (1) the identification of the involved stakeholders and their positions, (2) the characterization of the sociopolitical context of the conflict (legal forestry framework), (3) the collection of evidence of the conflict, (4) the recognition of the social and ecological effects of the conflict, and (5) the evaluation of the willingness for a dialogue between the parties. In the second stage, we acknowledged the existing alternatives for addressing the potential conflict.

Data obtained from interviews with householders was coded through the identification of key themes and patterns of information. Codes were primary defined in the interview guides, and new ones emerged during the elaboration of the database. By applying descriptive statistics to codes, we identified the attributes and opinions representative of the majority community perspective, and used them to define some of the variables corresponding to the conflict mapping (items 1, 4, and 5 of the conflict mapping).

To construct the official perspective of this case study, we used information obtained through interviewing the LPBR director and SEMARNAT. We also analyzed the contents of the reserve's management program (CONANP 2006), as well as official norms regarding forest use that included the General Law of Sustainable Forest

Development (LGDFS 2018), its regulation (Regulation LGDFS 2005), and the State of Campeche's Law of Sustainable Forest Development (LGDFS for the state of Campeche 2018). As a result of coding data from these official documents and the interviews with the LPBR and environmental authorities, we obtained the official perspective regarding the regulations and social aspects of forest use and charcoal production, and about the potential conflict associated with this activity. We used this data for describing variables 1, 2, and 5 of the conflict mapping.

Results

Charcoal Production

Among the activities practiced by the local people of Los Petenes, charcoal production was the main source of income for 64% of the interviewees and their families. Thirty-three percent of the charcoal producers mentioned the complementary and seasonal nature of charcoal production, together with other activities that are part of their livelihood strategies. The other activities that are implemented are agriculture, poultry breeding, apiculture, hunting, small-scale cattle ranching, and wage work outside the community.

The process of transforming firewood into charcoal by using earth kilns (Fig. 3) mainly takes place (in 94% of the cases) in the plot of each producer. In many cases (39%)



Fig. 3 The main stages of artisanal charcoal production with earth kilns. The firewood is piled in the form of a volcano (a), then the volcano is covered with dry grass and soil. While it burns, the oven is regularly visited (two or three times daily) to verify that the charcoal transformation process is proceeding adequately (b). When this

process finishes, after five days on average, the kiln is dismantled with the help of sticks and rakes and then extinguished with water (c). Finally, the resulting charcoal is manually placed in sacks of approximately 20 kg each for subsequent sale to the local intermediary (d)

producers use the sites employed in subsistence agriculture (i.e., *milpa*, the traditional shifting cultivation of maize, beans and squash [Eastmond and Faust 2006]), as well as the firewood obtained from clearing those lands, for making the charcoal. Furthermore, the areas used for firewood extraction are periodically rotated, allowing forest regeneration that, according to interviewees, takes approximately 10 years to recover and be subject to new use. Fifteen tree species are employed to make charcoal, none of which are under the protection of Mexican legislation (NOM-059 2001). Ninety-two percent of producers sell the charcoal to a local intermediary. If producers want to sell the charcoal outside the community, where the price is 67% higher, official permits supporting the legal origin of the product are required—documentation that producers currently do not have.

Conflict Mapping and Management

We structured this section according to an adapted synthesis from the guide for the effective management of conservation conflicts, by Redpath et al. (2013) (Fig. 1b).

Definition of the potential conflict

Although the use of wood and charcoal production occur in the producers' plots, in *ejidal* lands, where the LPBR has no legal jurisdiction, a concern on the part of the reserve authorities exists regarding the intensity of these activities. As there is no information documenting the charcoal production intensity and its changes over time, we can take the number of charcoal producers in the community as an indicator of the intensity of the activity. We found that there have not been changes in the last decade (45 producers reported by Arrocha and Villena [2012], 44 producers identified in the present study). However, according to the perceptions of the LPBR authorities, the intensity of charcoal production in the area could be exceeding the rates of natural regeneration of the vegetation. The LPBR argues that this poses a threat to forests within the reserve that, given its proximity, would be the natural choice for continuing firewood extraction by charcoal producers. We refer to this situation as a potential conflict, since the community does not currently use the forest inside the LPBR. If that was the case, it would mean a direct clash of interests between the reserve authorities' protection interests and the local producers' interests of use.

Identification of stakeholders and their perspectives

Local perspectives regarding the potential conflict The majority of charcoal producers (94%) work individually or with family members, and expressed no interest in working in groups. Regarding production permits, no interviewee

indicated they needed them. In relation to the LPBR, the majority of charcoal producers (81%) know of its existence, and indicated there was no problem with them regarding charcoal production (97%), since the reserve does not intervene in decisions about the activities performed in the plots (69%). The majority of the interviewees (72%) did not perceive a decrease in available raw material (firewood) in the *ejidal* area. Regarding the required actions for improving production conditions and the commercialization of charcoal, the need to obtain permits to sell charcoal outside the community (53%) and to improve its sale price (22%) were the main issues mentioned.

Official perspectives regarding the potential conflict The LPBR's official position is that, as a result of intense exploitation of the forest for charcoal production, an ecological impact exists for the forests surrounding the LPBR. Currently, there is no formal representation of the Los Petenes community in the reserve's Technical Advisory Committee, which hinders fluid communication between the reserve and the community. The reserve's proposal to create a Charcoal Production Committee (a locally inclusive working group for approaching this productive activity, referred to in section "Alternatives for conflict management"), is a way of establishing a direct link with charcoal producers, and to compensate for their lack of participation in the biosphere reserve committee.

According to the LPBR, budget cutbacks suffered by the Mexican environmental and productive sector over the last few years (e.g., elimination of support for subsistence agriculture) have hindered the possibility of the reserve having a more active presence in neighboring communities, limiting its ability to promote conservation practices in these communities.

It is important to highlight that the official position of SEMARNAT does not award authorization for the nonselective exploitation of the forest (i.e., *matorras* felling), even though there is no legal basis for this in Mexican legislation. Neither does SEMARNAT allow the transformation of firewood into charcoal in extraction areas.

Characterization of the sociopolitical context: Regulatory aspects of charcoal production

During the process of charcoal production, different permits bestowed by the appropriate federal authority, SEMARNAT, are required. Among the required permits is the Program of Forestry Management (PFM) that regulates wood extraction, as well as a series of forest documents to legally support the transportation of firewood, its transformation into charcoal in authorized sites, and finally, the transportation of the charcoal. Los Petenes has a PFM: however, it expired in 2016 and is pending renewal. The majority of the interviewees in Los

Petenes (89%) did not know that the PFM existed, nor the necessity of renewing it. This lack of awareness was even demonstrated by the *ejidal* authority, who is responsible for handling these affairs. Since none of these permits are in place in Los Petenes, currently charcoal production occurring there could be considered illegal.

Analyzing the legal instruments that regulate charcoal production in the case study (the LGDFS and its regulation, the corresponding law for the state of Campeche, and the management program of the LPBR), and contrasting them with the local ways of using the forest and the local expectations regarding charcoal production, we found some significant incompatibilities which may become obstacles for the local artisanal practice. Among the most relevant obstacle for this practice, according to forestry regulation, is the need to obtain authorization to (1) extract firewood, (2) register the sites where the kilns are located, and (3) transport the firewood and the charcoal. In the community, there is no clarity regarding the permits required for forest use. Particularly, there is confusion regarding who must obtain the permits for charcoal production, with 44% of the interviewed producers believing that it is the charcoal buyer's (the local intermediary) responsibility. A total of 25% believed that each producer should obtain the permits, 14% thought that the *ejidal* authority should, while 17% did not know who held the regulatory responsibility.

Evidence of the conflict

Referring to the ecological evidence of the potential conflict (i.e., the conservation status of the natural resource employed), we found no documented information supporting the alleged degradation of the exploited forest in the *ejido*, nor inside the reserve, as a consequence of firewood extraction for charcoal production. Neither does information exist about the rates of vegetation regeneration after this use.

Identification of impact

Similarly to the lack of ecological evidence, there is no registered information about the impact of charcoal production on the rate of deforestation in the *ejidal* land area or in the LPBR. The assessment of the decrease in vegetation cover expressed by the LPBR is based on flyovers performed in the region, and visits to the rural area by environmental authorities (pers. comm. LPBR director).

In contrast, in relation to the socioeconomic effects, we identified a potential concern for local livelihoods given the restrictions that could be established regarding forest use in the LPBR's zone of influence. Similarly, we identified that currently, the local population is being affected by the

surveillance activities conducted by the environmental authorities (rounds of surveillance by PROFEPA in the producing communities) in the *ejidal* common land areas, as well as by the enforcement of sanctions for firewood or charcoal transportation without the corresponding forestry documentation. There is a complex and strict regulatory framework for the conditions of rural artisanal production, such as the need of specific knowledge, money (approximately USD \$1337 for all permits) and time (six months approximately until permits are emitted)—neither of which local peasants usually have (CCMSS 2008). There is a forest law inadequate for the ecosystem dynamics of peninsular forests (considering its regeneration rates (Román-Dañobeytia et al. 2014). As a result, the activity is currently illegal. This impedes access to better sale prices for the charcoal, and places families in a context of insecurity in terms of performing the local activity of the highest relevance as a source of income.

Willingness to dialogue

According to interviewees, the LPBR's administration shows a willingness to dialogue, as demonstrated by its initiative to form a working committee specifically for addressing charcoal production, to promote trust between the reserve's authorities and the charcoal producers. With respect to the willingness of the charcoal producers to enter the dialogue, they seem to be less willing to modify their productive practice and to adapt themselves to the current legal framework. This, according to interviewees, has to do with factors such as a lack of internal cohesion and disinterest in working in groups.

Alternatives for conflict management

Currently, two proposed alternatives exist for approaching this conflict. One of the proposals is the Committee for Charcoal Production proposed by the LPBR, and the other is the PMP, proposed by a local NGO. The Committee for Charcoal Production aims to create a working group comprised of key regional stakeholders related to charcoal production (e.g., *ejidal* authorities from the charcoal producing communities, members of civil society and academia, and the LPBR, among others), who will promote a long-term vision of sustainable forest use for charcoal production. This represents a first step in building bonds of trust between the local charcoal producers and the reserve's authorities. Similarly, the committee seeks to support the proposal of a PMP (described in the following paragraph), particularly in relation to the attainment of permits for charcoal production and the strengthening of the relationships between the stakeholders interested in accomplishing this management proposal.

Table 1 Synthesis of the potential conflict and the main positions regarding it

Stages of conflict	Most relevant stakeholders	
	LPBR	Charcoal producers
<i>Conflict mapping</i>		
Definition of the conflict, and Main stakeholders' positions	Perceive an imminent entry of local producers in the LPBR for firewood extraction. Need to establish forest management practices that permit local livelihoods, oriented toward the sustainability of the activity and of forest use	Do not perceive a conflict with the LPBR, since it does not interfere in the common lands where the forest use takes place. They feel an impairment of their subsistence interest on the part of other federal environmental authorities (PROFEPA and SEMARNAT)
Characterization of the sociopolitical context	Inadequacy of the forest regulatory framework for the socioecological conditions of the region. Operational criteria of SEMARNAT: the local charcoal production practices are not authorized (i.e., <i>matarrasa</i> felling; transformation of firewood into charcoal in extraction areas)	
Evidence of the conflict, and Identification of impact	There is no evidence of the ecological impact on the forest as a consequence of charcoal production	Impact on the local livelihoods by limiting access to better charcoal sale prices (outside the community), by the continued fear of sanctions from the federal environmental authorities and of potential restriction of forest use
Willingness to dialogue	Yes	Partial
<i>Conflict management</i>		
Alternatives for conflict management ^a	Committee of Charcoal Production, Plot Management Program	No local proposals exist for conflict management

^aAt the time of this research, none of the alternatives were underway

The PMP is the second identified proposal, which seeks to create a forest management program adapted to the local production practices, while addressing the obstacles that the legal framework and the enforcement authorities present: the *matarrasa* felling practice and the transformation of the firewood into charcoal in the extraction areas. The PMP consists of a management model within a rotating use cycle of 10 years.

As a summary, in Table 1 we show the elements of the mapping and management of potential conflict in Los Petenes discussed above, according to the most relevant stakeholders' positions in the conflict.

Discussion

Performing activities for family subsistence (like charcoal production) in conservation contexts is of crucial relevance, because of the potential social impact that the restrictions imposed by a biosphere reserve can generate for local livelihoods (Robinson 2011; Woodhouse et al. 2015). In the case of Los Petenes, while a conservation conflict with the authorities of the LPBR does not exist currently, we define the situation as a potential conflict. As such, a direct clash of interests does not exist regarding the forest resource, currently and in the same territory, between the LPBR and the charcoal producers. However, the possibility of this

situation occurring in the near future exists. If the firewood extraction that is presently performed in the producers' plots within the zone of influence of the LPBR was extended to the reserve, a conflict of interests could occur between the local population and the LPBR.

Thus, we define a potential conflict as the situation in which a possible dispute between different stakeholders over a natural resource, with opposing interests regarding this resource (e.g., protection versus use), is detected early on. Literature on conflicts in protected areas has not emphasized the advantages of identifying and addressing conflicts before they emerge. For instance, Soliku and Schraml (2018b) state the importance of co-management for avoiding conflict escalation, but they do not focus on conflict prevention. Likewise, Young et al. (2016a) mention the anticipation of future conflicts, based on issues emerging from monitoring existent conflicts, but do not address the need to consider situations where conservation interests and local use of natural resources converge in order to detect possible arising conflicts. The proposal of this conflict characterization as potential, and its associated early detection, bring certain advantages for biosphere reserve management, which we discuss toward the end of this section.

At present, although no standing conflict exists with the LPBR and charcoal production in surrounding areas, a conflict does exist between charcoal producers and

environmental authorities in charge of forest regulations and surveillance (i.e., SEMARNAT and PROFEPA). This conflict situation with environmental authorities has been categorized as “conflict with conservation authorities” (De Pourcq et al. 2017), or as “conflict with the law, legislation and policies” (Soliku and Schraml 2018a). The need to englobe this type of conflict under a specific categorization reveals the frequent occurrence of this clashing of interests among local populations and official authorities in conservation contexts.

Our work documents a social impact on the local population from the ongoing conflict with environmental authorities regarding forest use, which is part of conflict mapping. This impact affects the local livelihoods as a consequence of federal legislation, which, despite recognizing the need for government to support community forest management (Merino-Pérez 2013), hinders the use of the natural resources (Román-Dañobeytia et al. 2014). In light of the absence of alternative sources of income, this situation fosters a context for illegal charcoal production (Gardner et al. 2016). The implications of a legislation disconnected from local contexts, that hampers a sound local forestry practice, are that ecological impacts could occur in the reserve, thereby compromising its conservation effectiveness.

We documented the nonexistence of studies regarding the ecological impact of regional charcoal production, which would be a crucial element in better understanding the conflict. This gap in information about the ecological impact of charcoal production is relevant for two reasons. First, it could lead to a possible application of the precautionary principle on the part of the LPBR regarding forest use, resulting in restrictions on resource use for the local population, as has previously happened with other natural resources in the same region (see Oliva et al. 2014). This could lead to an exacerbation of poverty in the community (Gardner et al. 2016). A precautionary reasoning (*sensu* Meijboom and Brom 2012) seems to prevail in the management of the LPBR, sustained by a lack of ecological information about the conservation status of animal and plant species in the reserve. In turn, this lack of information could be associated with the scarce availability of financial and human resources for the adequate operation of the reserve, a common cause of ineffectiveness of PA management worldwide (Lu et al. 2012; Van Cuong et al. 2017). Second, the absence of ecological information is relevant because it supports the need to study the ecological effects resulting from the local use of the forest. The resulting information would enable better decision-making for management (Redpath and Sutherland 2015). Such information would allow the existence or inexistence of an ecological impact on regional forests derived from charcoal production to be determined, as well as allowing definition of the long-

term potential for the sustainability of this activity (Gerez-Fernández and Alatorre-Guzmán 2007). This data becomes vitally important for the management of a potential conflict (Redpath et al. 2013) and would permit (1) knowledge regarding whether the current local practices and forest management are sustainable, and (2) reduction of the social impact of possible restrictive measures on forest use aimed at the preservation of this natural resource.

The producers do not perceive a decrease in the availability of firewood in their plots, which contradicts the views held by the reserve’s authorities that firewood extraction to make charcoal is severely affecting the forest. There is no evidence that charcoal extraction is environmentally destructive, hence no argument against this activity (Smith et al. 2017). This implies the need for ecological studies that can reveal the impact of the current rate of forest exploitation (Mohibbi and Cochard 2014).

Similarly, the assumption (without evidence) of the occurrence of an ecological impact caused by charcoal production, with no existing information to support it, suggests top-down management decision-making, which labels the local practice as an ecologically unsound one without having the information to support this (Brown 2007; Martín-López and Montes 2015). This, together with the prioritization of conservation objectives over local interests (Whitehouse 2015) and the imbalance of power in the management of the natural resources (Carmen et al. 2015; Dawson et al. 2018; Durand et al. 2015), leads to the subsequent application of restrictive conservation measures disconnected from local realities (Oliva and Montiel 2016). This illustrates the importance of promoting strategies that address these conservation conflicts (potential and current) without rejecting the local ways of using the environment, and assessing the viability of the local practices to be continued sustainably instead of assuming that they must be adjusted to comply with the standing legal regulations (Cooper and Kainer 2018; Smith et al. 2017; Wali et al. 2017).

Forcing the local management of natural resources to adjust to a regulatory framework can lead to an ineffective use of financial resources by imposing solutions from perspectives incompatible with those of local stakeholders (Wali et al. 2017), which would reinforce the conflict (Redpath et al. 2015) and could exacerbate the level of poverty in the community by restricting an activity relevant to local livelihoods (Gardner et al. 2016; Kefa et al. 2018). Similarly, in its last report regarding the worldwide state of forests, the Food and Agricultural Organization (FAO) recognized the need to reconcile the interests of all parties in the policy framework, oriented to sustainable forest management (FAO 2018). This reinforces the need to appraise local perspectives and practices during the development of this kind of policy. The need to design policies locally

linked to socioecological contexts and participatory implementation has been widely documented (see, for example, García-Frapolli et al. 2009, Bennet and Dearden 2014, Méndez-López et al. 2015, Bouamrane et al. 2016, Oliva and Montiel 2016). In particular, in contexts with a long history of community forest management, such as in Mexico, forestry policy needs to include local perspectives and should also rely in an adaptive knowledge and management which considers local experiences and expectations regarding forest use (Merino-Pérez 2013), such as those of Maya populations in the Yucatan Peninsula.

With its proposal to create a Committee of Charcoal Production, the LPBR is addressing two primary aspects of the management of conservation conflicts: building trust between the parties (Cooper and Kainer 2018; Reed 2008; Young et al. 2016b) and, resulting from the former, building a shared understanding by proposing a dialogue between local producers and other relevant stakeholders in the conflict (Dawson et al. 2018). The existing synergy among the proposals for conflict management in Los Petenes, like the Committee of Charcoal production and the PMP, shows the alignment among the intentions of the stakeholders with the greatest power to undertake conflict management actions. Nevertheless, although one of the most important elements for conflict management exists—a mechanism for building trust and promoting dialogue between parties (Redpath et al. 2013)—the legal framework is disconnected from the local practices and this hinders the conflict resolution process, demanding actions and interventions that exceed the areas of incidence of the involved parties.

Addressing potential conflicts presents a series of advantages that affect the effectiveness of conflict management, and consequently of the biosphere reserve. Among these advantages, we found that the early detection of potential conflicts permits the evaluation of the impact of a human activity (in this case, charcoal production) in a PA zone of influence before it extends to the PA, which could in time act as a trigger for conservation conflict. In this sense, the anticipation of conflicts through early detection would allow: (1) use of the time prior to the occurrence of impact inside the reserve to estimate the ecological impact of the anthropogenic activities in the PA's zone of influence, (2) reduction of the uncertainty in management by using this information, (3) the development of strategies for preventing or mitigating these ecological effects, and (4) consideration of the social impact of these preventive strategies on the human populations that base their livelihoods on the natural resources within the PA.

The time saved by the early detection of potential conflicts, before ecological or social effects occur, creates the possibility of carrying out stakeholders processes, which often involve long periods of time and effort (Reed 2008). Such stakeholder processes involve the building of trust and the establishment

of a dialogue between the parties, which are key factors in managing conservation conflicts (Redpath et al. 2013, 2015). Both the dialogue and the trust contribute to the building of a shared understanding among parties, laying the foundation for arriving at consensual solutions and, thus, to greater equity in PA management (Dawson et al. 2018). Thus, early detection enables the building of consensual solutions from the early involvement of those affected (Madden and McQuinn 2015), integrating conservation and the well-being of local populations (Wali et al. 2017).

Finally, the potential stage of the conflict emphasizes the relevance of working with alternatives for the early approach to its management, searching for a reconciliation between local livelihoods and the conservation of the ecosystem (Redpath et al. 2013). This could replace the frequent application of corrective or compensatory actions in conflict management. Because of the possibility of relying on evidence and information about the potential impact of the conflict, the uncertainty of the management itself is reduced (Jerneck et al. 2011), granting more room to maneuver in the process, which could positively mitigate the socio-ecological impact of the conflict.

Conclusions

Our study suggests the potential of early detection of conflicts as a way to foster conservation conflict management, thereby enhancing the effectiveness of biosphere reserves. Through our case study, we reaffirm the need to address human activities performed in conservation contexts, such as PAs and their zones of influence, particularly when these activities form part of the livelihoods and subsistence practices of the PAs' neighboring populations. By doing so, the early detection of conservation conflicts is favored.

The main advantage of early potential conflict detection is that it permits reduction of the uncertainty in management processes, enabling the collection of evidence and scientific information before the occurrence of socio-ecological impacts, making conservation efforts more efficient. In addition, we emphasize that this early approach contributes to conceiving management strategies that allow the development of stakeholder and social processes that require plenty of time, and that are key for the management of conservation conflicts in PAs throughout the world.

Finally, because conservation conflicts are inherent in the establishment and operation of PAs, we emphasize the importance of applying a preventative focus to address them. Early attention to potential conflicts could lead to better management solutions for the conflict itself, and for the PAs overall. More research is needed on the monitoring of early addressed conflicts, which will allow evaluation of the results of preventive management.

Acknowledgements The first author extends acknowledgment to the PhD Program in Sustainability Sciences, UNAM “Doctorado en Ciencias de la Sostenibilidad, Universidad Nacional Autónoma de México”, and a PhD scholarship received from CONACYT, Mexico. This research was funded by UNAM—PAPIIT, grant number IN302517. We are very grateful to the people who participated and shared valuable information for this study. We thank Mary Ann Hall for the English language revision.

Compliance with Ethical Standards

Conflicts of Interest The authors declare that they have no conflict of interest.

Publisher’s note: Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

- Anaya FC, Espirito-Santo MM (2018) Protected areas and territorial exclusion of traditional communities: analyzing the social impacts of environmental compensation strategies in Brazil. *Ecol Soc* 23(1):8
- Arrocha F, Villena MG (2012) Applying a bioeconomic optimal control model to charcoal production: the case of slash-and-burn agriculture in Mexico. *Cienc Investig Agr* 39(3):489–504
- Barrera-Bassols N, Toledo V (2005) Ethnoecology of the Yucatec Maya: symbolism, knowledge and management of natural resources. *J Lat Am Geogr* 4:9–41
- Baynham-Herd Z, Redpath S, Bunnefeld N, Molony T, Keane (2018) Conservation conflicts: Behavioural threats, frames, and intervention recommendations. *Biol Conserv* 222:180–188
- Bennet NJ, Dearden P (2014) Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Mar Policy* 44:107–116
- Bouamrane M, Spierenburg M, Agrawal A, Boureima A, Cormier-Salem MC, Etienne M, Le Page C, Levrel H, Mathevet R (2016) Stakeholder engagement and biodiversity conservation challenges in social-ecological systems: some insights from biosphere reserves in western Africa and France. *Ecol Soc* 21(4):25
- Brown DF (2007) The spatial and temporal dimensions of a rural landscape: the Yucatec Maya k’ax. *The Canadian Geographer / Le Geographe canadien* 51(1):91–108
- Carmen E, Young JC, Watt A (2015) Linking conflict and global biodiversity conservation policies. In: Redpath SM, Gutiérrez RJ, Wood KA, Young JC (Eds) *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press, Cambridge, United Kingdom, pp 180–189
- CCMSS (2008) *Tramitología: un fuerte obstáculo para el sector forestal de México*. Nota Informativa Número 19 Red De Monitoreo De Políticas Públicas – CCMSS JUNIO
- CONANP (2006) Programa de Conservación y Manejo. Reserva de la Biósfera Los Petenes. Comisión Nacional de Áreas Naturales Protegidas, Campeche, México
- Cooper NA, Kainer KA (2018) To log or not to log: local perceptions of timber management and its implications for wellbeing within a sustainable-use protected area. *Ecol Soc* 23(2):4
- Dawson N, Martin A, Danielsen F (2018) Assessing equity in protected area governance: approaches to promote just and effective conservation. *Conserv Lett* 11(2):1–8
- De Pourcq K, Thomas E, Arts B, Vranckxa A, Leónn-Sicard T, Van Damme P (2017) Understanding and resolving conflict between local communities and conservation authorities in Colombia. *World Dev* 93:125–135
- Durand L, Figueroa F, Trench T (2015) Inclusión, exclusión y estrategias de participación en la reserva de la biosfera Montes Azules (Chiapas). In: Durand L, Figueroa F, Guzmán M (Eds) *La naturaleza en contexto. Hacia una ecología política mexicana*. Colección Alternativas
- Eastmond A, Faust B (2006) Farmers, fires, and forests: a green alternative to shifting cultivation for conservation of the Maya forest? *Landscape and Urban Planning* 74:267–284
- FAO (2018) *El estado de los bosques del mundo - Las vías forestales hacia el desarrollo sostenible*. Roma. Licencia: CC BY-NC-SA 3.0 IGO
- Flores JS, Espejel I (1994) *Etnoflora Yucatanense. Tipos de Vegetación de la Península de Yucatán*. Fasc. No. 4. Lic. en Biología. Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Yucatán, Mérida
- García-Frapolli E, Ayala-Orozco B, Oliva M, Smith RJ (2018) Different approaches towards the understanding of socio-environmental conflicts in protected areas. *Sustainability* 10:2240
- García-Frapolli E, Ramos-Fernández G, Galicia E, Serrano A (2009) The complex reality of biodiversity conservation through Natural Protected Area policy: three cases from the Yucatan Peninsula, Mexico. *Land Use Policy* 26:715–722
- Gardner CJ, Gabriel FUL, ST. JOHN FAV, Davies ZG (2016) Changing livelihoods and protected area management: a case study of charcoal production un south-west Madagascar. *Oryx* 50(3):495–505
- Gerez-Fernández P, Alatorre-Guzmán E (2007) Los retos de la certificación forestal en la silvicultura comunitaria de México. In: Bray DB, Merino-Pérez L, Barry D (Eds) *Los bosques comunitarios de México Manejo sustentable de paisajes forestales*. Instituto Nacional de Ecología (INE-Semarnat), pp 99–120
- Haenn N (2006) The changing and enduring ejido: a state and regional examination of Mexico’s land tenure counter-reforms. *Land Use Policy* 23(2):136–146
- Halffter G (2011) Reservas de la biosfera: problemas y oportunidades en México. *Acta Zoológica Mexicana* 27(1):177–189
- INEGI (1997) Plano producido para el Registro Agrario Nacional. Ejido “Los Petenes”, Clave 001
- INEGI (2010) Censo de Población y Vivienda 2010. http://www3.inegi.org.mx/sistemas/iter/entidad_indicador.aspx?ev=5. Accessed 17 Apr 2016
- Jerneck A, Olsson L, Ness B, Anderberg S, Baier M, Clark E, Hickler T, Hornborg A, Kronsell A, Lövbstrand E, Persson J (2011) Structuring sustainability science. *Sustain Sci* 6:69–82
- Kefa CA, Lung M, Espira A, Gregory AJ (2018) Quantifying the rate of subsistence wood harvesting from a tropical rainforest in Kenya. *Oryx* 52(2):369–373
- León P, Montiel S (2008) Wild meat use and traditional hunting practices in a rural Mayan community of the Yucatan Peninsula, Mexico. *Hum Ecol* 36:249–257
- Lewis C (1996) *Managing Conflicts in Protected Areas*. International Union for Conservation of Nature (IUCN), Gland, Switzerland
- LGDFS (2018) *Ley General de Desarrollo Forestal Sustentable No. – (05 de Junio)*. http://www.diputados.gob.mx/LeyesBiblio/pdf/LGDFS_050618.pdf. Accessed 3 Jul 2018
- LGDFS for the state of Campeche (2018) *Ley General de Desarrollo Forestal Sustentable para el Estado de Campeche No. – (12 de Abril)*. http://legislacion.congresocam.gob.mx/images/legislacion/leyes/pdf/ley_de_desarrollo_forestal_sustentable_para_el_estado_de_campeche.pdf. Accessed 3 Jul 2018
- Lu DJ, Kao CW, Chao CL (2012) Evaluating the management effectiveness of five protected areas in Taiwan using WWF’s RAPPAM. *Environ Manage* 50:272–282
- Madden F, McQuinn B (2015) Conservation conflict transformation: the missing link in conservation. In: Redpath SM, Gutiérrez RJ,

- Wood KA, Young JC (Eds) *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press, Cambridge, United Kingdom, pp 257–267
- Martín-López B, Montes C (2015) Restoring the human capacity for conserving biodiversity: a social-ecological approach. *Sustain Sci* 10:699–706
- Meijboom FLB, Brom FWA (2012) Ethics and sustainability: guest or guide? On sustainability as a moral idea. *J Agric Environ Ethics* 25:117–121
- Méndez-López ME, García-Frapolli E, Ruiz-Mallén I, Porter-Bolland L, Reyes-García V (2015) From paper to forest: local motives for participation in different conservation initiatives. *Case Studies in Southeastern Mexico*. *Environ Manage* 56:695–708
- Merino-Pérez L (2013) Conservation and Forest Communities in Mexico: Experiences, Visions, and Rights. In: Porter-Bolland L, Ruiz-Mallen I, Camacho-Benavides C, McCandless SR (Eds) *Community Action for Conservation: Mexican Experiences*. Springer Science+Business Media, New York, NY, p 25–44
- Mohibbi AA, Cochard R (2014) Residents' resource uses and nature conservation in Band-e-Amir National Park, Afghanistan. *Environ Dev* 11:141–161
- Newing H (2011) *Conducting Research in Conservation. A Social Science perspective*. Ed. Routledge, New York, NY
- NOM-059 (2001) Norma Oficial Mexicana NOM-059-ECOL-2001, Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo (2001). No. – (6 de Marzo de 2002). http://www.profepa.gob.mx/innovaportal/file/435/1/NOM_059_SEMARNAT_2010.pdf. Accessed 3 Jul 2018
- Oliva M, Montiel S (2016) Stakeholder linkage in conservation strategies: a qualitative tool for improving the management of a biosphere reserve in the Yucatan Peninsula, Mexico. *Trop Conserv Sci* 9(1):423–438
- Oliva M, Montiel S, García A, Vidal L (2014) Local perceptions of wildlife use in Los Petenes Biosphere Reserve, Mexico: Maya subsistence hunting in a conservation conflict context. *Trop Conserv Sci* 7(4):781–795
- Redpath SM, Sutherland WJ (2015) The value of ecological information in conservation conflict. In: Redpath SM, Gutiérrez RJ, Wood KA, Young JC (Eds) *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press, Cambridge, United Kingdom, pp 35–45
- Redpath SM, Gutiérrez RJ, Wood KA, Young JC (2015) Finding a way out of conservation conflicts. In: Redpath SM, Gutiérrez RJ, Wood KA, Young JC (Eds) *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press, Cambridge, United Kingdom, pp 287–300
- Redpath SM, Young J, Evely A, Adams WM, Sutherland WJ, Whitehouse A, Amar A, Lambert RA, Linnell JDC, Watt A, Gutiérrez RJ (2013) Understanding and managing conservation conflicts. *Trends Ecol Evolut* 28(2):100–109
- Reed MS (2008) Stakeholder participation for environmental management: A literature review. *Biol Conserv* 141:2417–2431
- Regulación LGDFS (2005) Reglamento de la Ley General de Desarrollo Forestal Sustentable No. – (21 de Febrero). Accessed 3 July 2018.
- Robinson JG (2011) Ethical pluralism, pragmatism, and sustainability in conservation practice. *Biol Conserv* 144:958–965
- Rodríguez M, Montiel S, Cervera MD, Castillo MT, Naranjo EJ (2012) The practice and perception of batida (group hunting) in a maya community of Yucatan, Mexico. *J Ethnobiol* 32(2):212–227
- Román-Dañobeytia FJ, Levy-Tacher SI, Macario-Mendoza P, Zúñiga-Morales J (2014) Redefining secondary forests in the Mexican forest code: implications for management, restoration, and conservation. *Forests* 5:978–991
- Smith HE, Hudson MD, Schreckenberg K (2017) Livelihood diversification: The role of charcoal production in southern Malawi. *Energy Sustain Dev* 36:22–36
- Soliku O, Schraml U (2018a) Making sense of protected area conflicts and management approaches: a review of causes, contexts and conflict management strategies. *Biol Conserv* 222:136–145
- Soliku O, Schraml U (2018b) From conflict to collaboration: the contribution of co-management in mitigating conflicts in Mole National Park, Ghana. *Oryx* 1–11. <https://doi.org/10.1017/S0030605318000285>
- UNESCO (1996) *Reservas de biosfera: La Estrategia de Sevilla y el Marco Estatutario de la Red Mundial*. UNESCO, París
- UNESCO (2014) *Biosphere Reserves – Learning Sites for Sustainable Development*. <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/>. Accessed 5 Sept 2018
- Van Cuong C, Dart P, Hockings M (2017) Biosphere reserves: attributes for success. *J Environ Manage* 188:9–17
- Wali A, Alvira D, Tallman PS, Ravikumar A, Macedo MO (2017) A new approach to conservation: using community empowerment for sustainable well-being. *Ecol Soc* 22(4):6
- Whitehouse A (2015) Anthropological approaches to conservation conflicts. In: Redpath SM, Gutiérrez RJ, Wood KA, Young JC (Eds) *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press, pp 94–104
- Wolf F, Vogel E (1985) *Manual para la producción de carbón vegetal con métodos simples*. Facultad de Silvicultura y manejo de recursos renovables. Universidad Autónoma de Nuevo León
- Woodhouse E, Homewood KM, Beauchamp E, Clements T, McCabe JT, Wilkie D, Milner-Gulland EJ (2015) Guiding principles for evaluating the impacts of conservation interventions on human well-being. *Phil Trans R Soc B* 370:20150103
- Young JC, Thompson DBA, Moore P, MacGugan A, Watt A, Redpath SM (2016a) A conflict management tool for conservation agencies. *J Appl Ecol* 53:705–711
- Young JC, Searle K, Butler A, Simmons P, Watt AD, Jordan A (2016b) The role of trust in the resolution of conservation conflicts. *Biol Conserv* 195:196–202

CAPÍTULO 4. SHARED UNDERSTANDING FOR CONFLICT MANAGEMENT IN CALAKMUL BIOSPHERE RESERVE, MEXICO

Oliva, M., García-Frapolli, E., Porter-Bolland, L. y Montiel, S. (n.d.). Shared Understanding for Conflict Management in Calakmul Biosphere Reserve, Mexico. *Journal of Environmental Management* (under review).

Shared Understanding for Conflict Management in Calakmul Biosphere Reserve, Mexico

Malena Oliva^a, Antigua carretera a Pátzcuaro No. 8701, Col. San José de la Huerta, Morelia 58190 Michoacán, Mexico. malenaoliva@gmail.com

Eduardo García-Frapolli^a, Antigua carretera a Pátzcuaro No. 8701, Col. San José de la Huerta, Morelia 58190 Michoacán, Mexico. garcia.frapolli@gmail.com

Luciana Porter-Bolland^b, Carretera antigua a Coatepec 351, El Haya, Xalapa, Veracruz 91070, Mexico. luciana.porter@inecol.mx

Salvador Montiel^c, México, Km. 6 antigua carretera a Progreso, Mérida, Yucatán 97310, Mexico. montiels@mda.cinvestav.mx

^a Instituto de Investigaciones en Ecosistemas y Sustentabilidad, Universidad Nacional Autónoma de México.

^b Red de Ecología Funcional, Instituto de Ecología, A.C.

^c Departamento de Ecología Humana, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN), Unidad Mérida.

Corresponding author: Eduardo García-Frapolli garcia.frapolli@gmail.com

Abstract

Conservation conflicts in biosphere reserves are widespread around the globe, compromising the conciliation of conservation goals with local livelihoods. For managing these conflicts, one of the main strategies comprises building a shared understanding among the parties involved. In doing so, it is important to understand parties' perspectives on the conflict and possible solutions. However, there is little empirical evidence on how a shared understanding contributes to conservation conflict management. Based on two communities in Calakmul Biosphere Reserve (CBR) in Southeast Mexico, we analysed the existence of a shared understanding by contrasting reserves' administration and local populations' perspectives on conflicts, and the implications of a shared understanding for

their management. We found that a shared understanding might not be a determining factor for conflict management when the conflict solution demands actions that exceed the main stakeholders' attributions. While a shared understanding does help the global process of conflict management, i) the local impairment resulting from the exclusionary creation and operation of protected areas and ii) the lack of clarity regarding stakeholders' scope of action, represent significant hinderers in conflict management.

Keywords: stakeholder perspectives; social exclusion; protected area management; Yucatan Peninsula

1. Introduction

The establishment of biosphere reserves, widespread around the globe, has generated social impacts on local populations, giving rise to conservation conflicts and compromising the effectiveness of these protected areas (Durand et al., 2015; Bouamrane et al., 2016; Woodhouse et al., 2018). International conservation policy, specially the Aichi Target 11 of the Convention on Biological Diversity, promotes the use of protected areas to fight biodiversity loss (CBD 2011). This is of special concern considering the inheritance of protected areas, and biosphere reserves, to generate conservation conflicts (de Pourcq et al., 2017). In such conflicts, stakeholders do not share their opinion about how to manage or use natural resources (Young et al., 2010): some stakeholders (e.g. protected area managers) foster biodiversity protection, while others (e.g. local populations) are keener to use natural resources, frequently for subsistence purposes (Dower, 2015).

In the context of conflicts in protected areas, a shared understanding among parties or stakeholders is key for such conflicts' management. Acknowledgment of conflict as a shared problem, where parties recognize responsibilities both regarding the conflict and for seeking solutions, is also crucial to advancing in conflict management processes (Redpath et al., 2015b). The former stands on the recognition that conservation conflicts arise because of a clash of interests: if neither party had an interest in preserving

biodiversity, there would be no conflict, just as there would be no conflict if neither of the parties had an interest in using natural resources (Redpath et al., 2013).

The management of conservation conflicts aims at conciliating conservation goals with local livelihoods, generating processes in which people can share their opinions on conservation (Young et al., 2016). The latter is considered to lead to an improvement in the understanding among parties, thus contributing to finding shared solutions. Shared understanding refers to how different stakeholders perceive conflicts (what parties conceive as the problem) and the alternatives for managing them (Redpath et al., 2013; Mathevet et al., 2016; Young et al., 2016).

In the context of biosphere reserves, which hold a similar dual objective to conflict management (i.e., achieve conservation and local wellbeing), a shared understanding among parties becomes especially relevant given the explicit recognition of the need of the protected area to consider local interests. Perceptions of local inhabitants inside or near biosphere reserves, therefore becomes another key factor for conflict management (García-Frapolli et al., 2009; Durand et al., 2015). Local perceptions help understand the expectations that communities have regarding the reserve's management (Hernes and Metzger, 2017) contributing to the conflict management process.

Accordingly, for advancing in the building of shared understandings, it is critical to comprehend the different perspectives of parties, especially local ones (Bennett, 2016), in order to consider the different values and worldviews of all actors involved (Redpath et al., 2015b; Bennett and Dearden, 2014; Hernes and Metzger, 2017). The fact that parties frequently hold different worldviews is precisely what makes reaching shared understandings challenging (Redpath et al., 2015b). Understanding the way in which different stakeholders conceive conflicts is important because those conceptions determine the perspective of alternative solutions or ways of managing conflicts (Chamberlain et al., 2012).

Considering the widespread existence of conflicts in protected areas (Cumming, 2016; Oldekop et al., 2015; Baynham-Herd et al., 2018; Soliku and Schraml, 2018), the stated relevance of a shared understanding as central for conflict management (Redpath

et al., 2015b; Young et al., 2016) and the limited evidence on the former, this paper analyses two case studies situated within the territory of an emblematic exclusionary-decreed reserve (Galindo-Leal, 1999; Ericson, 2006), the Calakmul Biosphere Reserve (CBR), located in Southeast Mexico. Here, we describe and disentangle the elements of two different conservation conflicts related to the protected area, for which we aim to i) understand the main parties' perspectives on the conflicts; ii) define if there exists a shared understanding on the conflicts; and iii) comprehend the relevance of a shared understanding for conflict management.

2. Material and methods

2.1. Area and study communities

The CBR was decreed in 1989 through a non-participative process, excluding stakeholders' opinions (CONANP, 1999; Galindo-Leal, 1999). Its 723,185 ha harbours the most important tropical forest relict in Mexico (CONANP, 1999). The reserve holds a large human population since its creation, whose non-participation in the planning and decision-making process of the CBR has been considered to have caused several conflicts since its establishment (Galindo-Leal, 1999; Porter-Bolland et al., 2013; Ruiz-Mallén et al., 2015a). The two communities where the study took place are Centauro del Norte (CN) and El Sacrificio (ELS), which are located in the south of the CBR and both overlap with the reserve (Fig. 1). These communities were selected because they represent two of the most salient conflicts in the context of the CBR, each one with singularities on the way conflicts were managed, which allows the particularities of the processes to be explored.

CN was created in 1987, two years before the reserve was decreed. The community has a communal land tenure regime, known in Mexico as *ejido*, and its population is of 236 inhabitants (INEGI, 2010) with generally no indigenous origin. This *ejido* spans 10,024 ha, of which 2,640 ha overlap the reserve's core area. The rest, 7,384 ha, is part of the buffer zone of the reserve (INEGI, 1996). Each landholder (i.e., *ejidatario*) has usufruct rights to 100 ha plot. On the other hand, ELS was created in 1999 through the relocation of four other communities originally located in what was then defined as the

core area of the reserve. This community has a population of 540 inhabitants (INEGI, 2010), having a private property land tenure regime. However, local people do not have official land titles, which has been a conflicting issue since the establishment of ELS. Community land spans 2,160 ha, of which 215 ha are within the reserve's core area, and 1024 ha in its buffer zone (Periódico Oficial, 2000; CONANP, 2015). Family's plots are 20 ha large. Chol, Tzeltal, Tzotzil indigenous groups as well as mestizo families are present in this community.

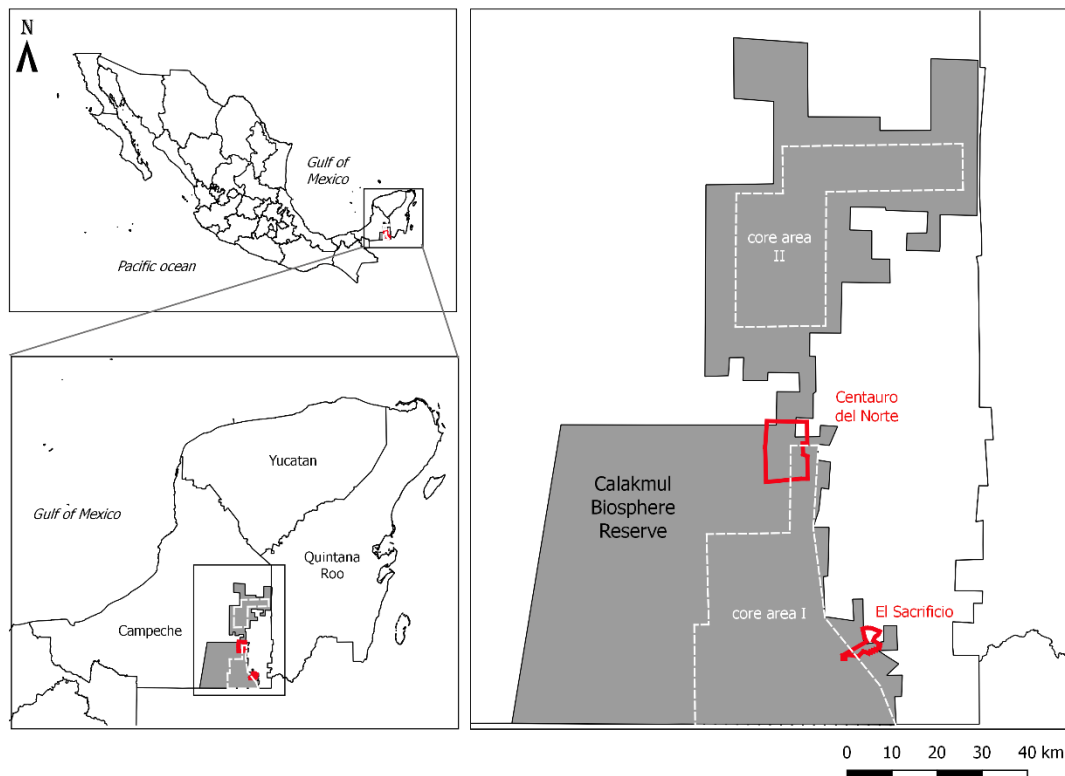


Figure 1. Calakmul Biosphere Reserve in Campeche, Mexico (grey area). The area within the white dashed line is the core area of the reserve. The study communities, El Sacrificio and Centauro del Norte, are delimited with a red line.

2.2. Data collection and fieldwork

Thirty-three semi-structured interviews were applied in each community to landholders and to those without land rights (i.e., *pobladores*), selected through simple random sampling from population lists provided by local authorities (Newing, 2011). Through the semi-structured interviews we collected data on a) the community context (e.g., local

livelihoods, presence of non-governmental organizations (NGOs), history of the relationship with the reserve); b) the impact of the reserve and its regulations on local livelihoods; and c) local perspectives regarding conflicts. This information was used for describing the conflicts and as an input to assess the existence of a shared understanding with the reserve's authorities. Semi-structured interviews were also performed with community authorities, mainly regarding the history of conflict management.

To understand the official perspectives of conflicts, an in-depth interview (following Bryman, 2001) was performed to the director of the CBR. This interview aimed at understanding whether the reserve recognized conflicts perceived by communities, the role that different actors involved played, as well as the causes of the conflicts, and their management constraints.

In-depth interviews were also performed to NGO's staff, whose role has been to work in ELS since its creation. Additionally, we applied unstructured interviews (Newing, 2011) to agrarian authorities [Secretariat of Agrarian, Territorial and Urban Development (SEDATU) and Agrarian Attorney (PA)], for knowing the position of these institutions regarding the study communities' land tenure situation.

Finally, participant observation (Newing, 2011) was carried out in the studied communities to complement data obtained through interviews. Observation offered useful information to understand the organizational context in the communities, as well as perceptions regarding other stakeholders. The research took three years and during this time the first author resided in the study region, which allowed in depth participant observation regarding the different institutions involved (i.e., federal agencies, NGOs, local organizations, and the CBR). Residency in the study area also permitted multiple unstructured interactions with CBR's personnel, as well as with local stakeholders (i.e., NGOs, people from communities), and promoted a wider understanding of the complex social and interinstitutional framework that characterizes the region.

2.3. Data analysis

2.3.1. Conflict mapping

Following Redpath et al. (2013), we mapped the conflicts considering 1) the identification of the involved stakeholders and their positions, 2) the characterization of the sociopolitical context, 3) the evidence of the conflict, 4) the recognition of the social and ecological impacts of the conflict, and 5) the willingness for dialogue between the parties.

2.3.2. Coding, patterns and statistical analysis

The information generated through interviewing household members was coded for identifying key themes and patterns of information (Newing, 2011). Codes were also used for performing a homogeneity test, in order to compare perspectives between communities (Frankfort-Nachmias and Leon-Guerrero, 2009). When conditions for performing a homogeneity test were not met (>20% of the expected frequencies were <5), we used the test for the differences between two population proportions instead (Frankfort-Nachmias and Leon-Guerrero, 2009) (i.e., productive activities promoted by the reserve in the community, willingness to engage in dialogue with the reserve). We used a significance level of $\alpha = 0.05$ for all analyses.

2.3.3. Shared perspectives

In order to determine the existence of shared understanding, we compared the opinions of the main stakeholders involved in conflicts (i.e., local communities and CBR administration) regarding six relevant topics for conservation conflict management: i) definition of the conflict; ii) responsibilities for finding solutions; iii) main obstacles for conflict management; iv) type of interest in territory and natural resources; v) need to conserve natural resources; and vi) alternatives for conflict management. These topics were derived from conservation conflict literature (Redpath et al., 2013; 2015a; 2015b; Mathevet et al., 2016; Young et al., 2016), and from salient socioecological issues associated to the studied communities. Three possible outcomes for shared understanding were established: yes, when perspectives on the topic were similar or

compatible, *no* when they were not, and *intermediate* when there was a certain level of coincidence between parties' perspectives, but not complete agreement.

3. Results

3.1 Conflict mapping

In 1992, the community of CN presented a lawsuit ("*juicio de amparo*" which guarantees the protection of an individual's constitutional rights) against the Mexican Federal Government, claiming their rights to land due to the prior establishment in the area (1987), before the reserve was created (1989) (Fig. 2). The community won the lawsuit, and contrary to the rest of the surrounding communities, it became exempt from the reserve and its regulations. However, local people stated that they currently face restrictions on the use of their natural resources.

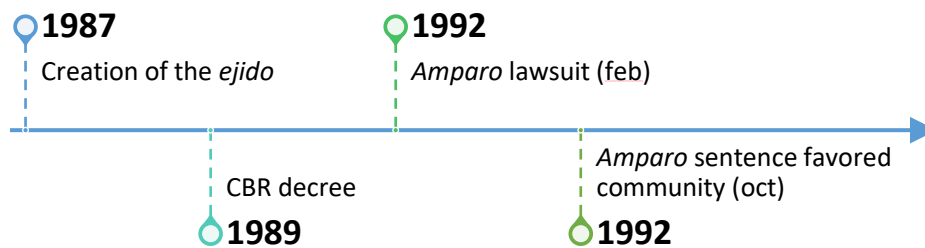


Figure 2. Timeline of the conservation conflict in Centauro del Norte, Calakmul, Campeche.

On the other hand, ESL is a relocated community. When the CBR was decreed in 1989, many communities fell inside the protected area and four of these were relocated into a new area a decade after its establishment, forming the ELS (Fig. 3).

Despite its relocation, part of the community's territory still fell inside the protected area. For this reason, property titles of the new community were never given out to families. The lack of documents supporting the legal land tenure has hindered the

community's participation in development projects and other supports given by the government and NGOs. Besides this legal uncertainty regarding land tenure, the community faces a restriction of natural resources' use on the part of the reserve.

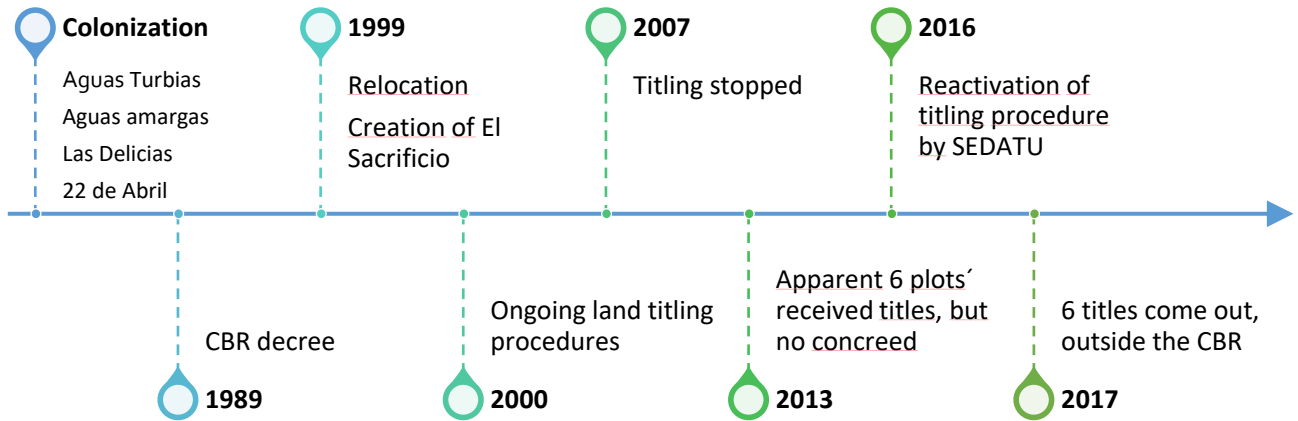


Figure 3. Timeline of the conservation conflict in El Sacrificio, Calakmul, Campeche.

Further descriptions of conflicts, following Redpath et al. (2013) categories for conflict mapping, is presented in Figure 4. In both cases, the conflict refers to the overlapping of the communities with the reserve's polygon. This has resulted in a permanent tension between production and conservation objectives in the CBR.

1.1 Stakeholders' perspectives

1.1.1 Local stakeholders

There is a general negative perception of the CBR, especially in ELS, where respondents said that the reserve does not consider local interests or generate benefits for them, but on the contrary, brings difficulties to the community. However, when asked about the willingness to engage in dialogue, none of the interviewees answered "no" (Table 1). This shows disposition from the community to interact with the reserve's authorities, even when there exists a local feeling of impairment and the expectation of being compensated by the government for past actions (i.e., relocation without compensation) and for the current conservation that local people state to be carrying out in their lands that overlap with the reserve's polygon.

Table 1. Comparison of local perspectives and opinions in both study communities.

LOCAL PERSPECTIVES ABOUT CONSERVATION AND THE CBR	CENTAURO DEL NORTE	EL SACRIFICIO	HOMOGENEITY TEST; χ^2
How is the relationship between the community and the reserve?	No answer	Good	*
Does the reserve consider local interests?	Yes	No	*
Did the reserve bring difficulties to the community?	No	Yes	*
Do you decide what activity to perform in your plot?	Yes	No	*
Does the reserve bring you benefits?	Yes ¹	No	*
Has the reserve promoted productive activities in the community?	No		
Is there willingness to dialogue with the reserve?	Yes		
Is conservation of nature necessary?	Yes		
Is it possible to conserve an area and to develop your livelihoods in the same place?	Yes		

¹"Yes" means that community receives subsidies from the reserve.

* Significant *P* value (< 0.05)

In CN, the absence of markets for local products is acknowledged as one of the obstacles for developing productive activities. In contrast, in ELS, a lack of productive and economic alternatives was identified. According to inhabitants in ELS this relates to the bad quality of soils and to the fact that most plots have been already "worked" (i.e., deforested). Also, 27% of interviewees in ELS mentioned that plot size (i.e., 20 ha) is a limiting condition for a family's livelihood. In CN, plots are as large as 100 ha, so it is not considered a constraint for productive activities. Local inhabitants consider that with 100 ha, they can perform subsistence activities and still leave a portion of the plot without productive or extractive use, where the forest is preserved. On the contrary, the plot size in ELS was not considered to be big enough for combining conservation and livelihood activities, but interviewees had the opinion that both activities would be possible if the available surface was larger. In both communities, interviewees mentioned that conservation opposes the use of natural resources and that there should be compensation for the forest conservation they are carrying out by not using natural resources on most of their plots.

A

CENTAURO DEL NORTE

The conflict

Reserve overlapping the community's polygon.

In 1992 the community won an *amparo* lawsuit against the Federal Government (no reserve's regulation was to be applied in that specific community).

However, the reserve still imposes restrictions to the community.

Parties' position

Community:

Should be compensated (\$) by the government for conserving their territories. CBR is responsible for solving the conflict.

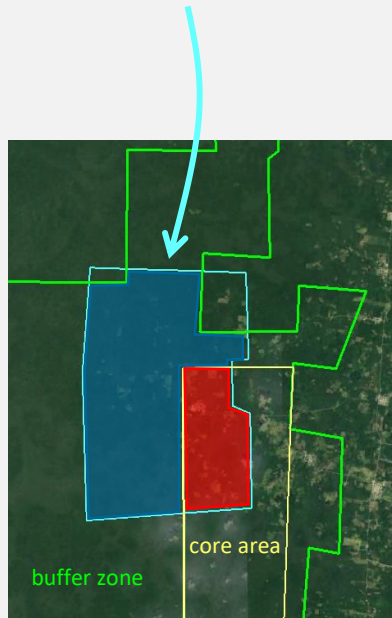
CBR:

Community located in core and buffer areas of the reserve.

Community can use only a small surface of their lands each year for subsistence activities.

Agrarian federal authorities:

Community lands officially recognized and registered in the National Agrarian Registry.



■ 7,384 ha overlapping with buffer zone
 ■ 2,640 overlapping with core area

Sociopolitical context

Adoption of international conservation policy (i.e., Aichi Target 11) by federal conservation agency, and application in local contexts without adjustment to social conditions and historical context.

Evidence of conflict

Social impact: local feeling of being constrained by the reserve, on their activities (and fear of being punished). Ecological impact: no official evidence, but freely accessible satellite images (GoogleEarth) show deforestation in some areas.

Willingness to engage in dialogue

Community: yes, under the assumption that they have the legal protection through the *amparo*, and the expectation that the reserve could bring good proposals for local development.

CBR: yes.

B

EL SACRIFICIO

The conflict

Reserve overlapping community's polygon, even after community was relocated to resolve a former overlapping.

Titling stagnation mainly because of overlapping, increasing local vulnerability due to legal uncertainty on land tenure, and preventing local community's participation in development projects.

The reserve still imposes restrictions to the community.

Parties' position

Community:

Expectation of receiving a compensation from the government for the impairment suffered in relocation process and titling stagnation.

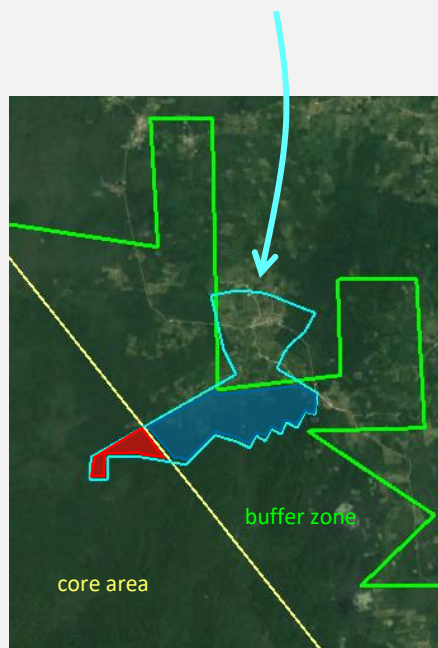
Blame on the reserve and the government for title process stagnation.

CBR:

Not empowered to grant lands' titles.

Heir of past mismanagement of the conflict by former reserve's administration and other government agencies.

Need of support from the State government for getting titles.



■ 1,024 ha overlapping with buffer zone
 ■ 215 ha overlapping with core area

Sociopolitical context

Adoption of international conservation policy (i.e., Aichi Target 11) by federal conservation agency, and application in local contexts without adjustment to social conditions and historical context.

Evidence of conflict

Social impact: local population development opportunities constrained because of lack of land titles. Ecological impact: no official evidence, but freely accessible satellite images (GoogleEarth) show deforestation in much of the community lands.

Willingness to engage in dialogue

Community: yes, but permeated by historical resentment, and an expectation that it is the reserve who should bring solutions.

CBR: yes, but not willing to visit the community until they have a feasible solution or proposal to offer.

(CBR continue...)

Proposed to modify the reserve's polygon to disincorporate community and thereby enable titling.

Recognizes community's right to land.

Agrarian federal authorities:
Inexistence of community's file or record.

Since lands are inside a federal biosphere reserve, they cannot grant titles.

Figure. 4. Description of the conflict in Centauro del Norte (A) and in El Sacrificio (B). The map shows with the green line the polygon of the CBR, and its core area with the yellow line. Blue line depicts communities' polygon. Coloured in blue, we show the overlapping of the communities with the buffer zone of the reserve and coloured in red the overlapping with the core area.

People felt deceived by the reserve. Both in ELS and CN, a quarter of interviewees mentioned distrusting the CBR and third parties (i.e., the NGO that accompanied ELS), and that there have been broken promises from the part of the government, the reserve, and NGOs. In general, there is a tired feeling among community members regarding the government and other stakeholders' interventions.

Regarding the perceived impacts of the conflict, both communities identified a restriction on the use of their natural resources, only being allowed by the reserve to use a small portion of their land for subsistence purposes. Additionally, in the case of ELS, 33% of interviewees mentioned the impossibility of receiving subsidies and development programs due to the lack of land titles, which is a fundamental requisite for participating in this kind of support.

In CN, 27% of interviewees stated that they would be willing to collaborate with the reserve if there was a good proposal. Additionally, approximately 15% mentioned that the reserve is not giving enough financial support to the community and that there is a need to receive support from the government to develop productive activities in the community. In both cases, it was appreciated that there was a lack of clarity regarding the attributions and functions of different government agencies, manifested in expressions on those responsible for conflict resolution.

1.1.2 CBR authority

There is a recognition from the current CBR administration of the impairment caused to local communities by the imposed establishment of the reserve and of the agrarian debt regarding the assurance of land rights to ELS. These two reasons are acknowledged by the reserve director as the basis of the conflict between the reserve and the communities. This applies particularly to the case of ELS that have no land titles. Regarding CN, from the

CBR administration perspective, there is no conflict, because the reserve's management program allows productive activities in the area where the *ejido* is located.

Concerning the strategy for managing the conflict in ELS, the reserve director has proposed the disincorporation of the community from its polygon. The argument sustaining this proposal is that the lands occupied by ELS have already been deforested. However, a reduction of the reserve's surface by disincorporating a community, even when there was a proposal for incorporating new land to compensate for the surface lost, was not accepted by the National Commission of Natural Protected Areas (CONANP).

In the case of CN, it was proposed by the reserve's director to compensate *ejidatarios* with an annual payment of US\$21/ha for the conservation of their lands. Local people did not accept this offer because it represents less money than the benefit they could obtain by working their plots.

Regarding the obstacles for managing the conflicts, the reserve's director acknowledges four main issues: i) the intervention of the NGO, considered a non-legitimate third party representing ELS, which impedes a direct dialogue with local people; ii) a conservation policy that does not allow for a reduction of the protected area surface for recognizing the land of ELS; iii) institutional limitations for enacting management measures (e.g., reserve cannot grant land titles, which is an attribute of the agrarian authority [SEDATU] which has no jurisdiction inside a federal protected area); and iv) passivity and lack of will from the state government and communities in supporting the reserve for conflict management.

From participant observation we appreciated CBR's activities, meetings and the —sometimes limiting—conditions in which the reserve has to operate, such as insufficient budget (e.g., lack of fuel for vehicles to visit communities), and the need to abide by CONANP norms.

1.1.3 Third parties

Agrarian authorities (PA and SEDATU) do not assume any responsibility for the entitling of lands in ELS, indicating that because lands are inside a federal protected area, they have

no attributions for entitlement. Furthermore, the PA authority mentioned that it would be frowned upon if the surface of the biosphere reserve was reduced by the disincorporation of a community (i.e. ELS).

There is one NGO that has been working closely with the ELS community since the beginning of the conflict, when the relocation took place. At that time, an agreement was signed by the community and the state government, establishing that: i) the government would give local people construction materials for building new houses; ii) people would be allowed to use the forest for subsistence purposes; and iii) the government would pay for all the expenses related to tilting processing. The agreement was breached, as the NGO's representative and community members mentioned. Some of the main events related to the non-compliance of the agreement were that construction material was not delivered to families and the fact that 24 out of 73 plots did not receive government payment for titling process.

1.2 Shared understanding

By comparing main parties' perspectives on conflicts and considering the primary topics relevant for conflict management, we identified different levels of shared understanding (Table 2). We found contrasting perceptions among stakeholders. Of a total of six issues reviewed, half of them lacked a shared understanding, while for other two, there was no clear agreement or disagreement among parties. The primacy of a lack of a shared understanding among local communities and CBR administration can be appreciated.

Table 2. Shared understanding on relevant topics for conflict management in the CBR, Mexico.

Topic	Stakeholder perspective			Shared perspectives/ understanding			Comments
	Centauro del Norte	El Sacrificio	CBR's administration	Yes	No	Inter mediate	
What the conflict is about	<i>CBR constraining local natural resource use</i> <i>Debt from government</i>	<i>CBR impeding land titling and constraining local natural resource use</i> <i>Debt from government</i>	<i>Ecological impact by local productive activities</i> <i>SEDATU impeding land titling</i> <i>Historical agrarian debt and reserve imposition</i> <i>No conflict recognition regarding CN</i>			X	There is partial agreement that the government should grant land rights to communities (titles and right of use), but there is no agreement regarding the type or intensity of activities allowed on those lands Since the management program of the reserve admits productive activities in the buffer and core area, for the CBR there is no conflict with CN
Who is responsible for solving the conflicts	<i>Mainly CBR</i>		<i>State government (support for pressuring federal government)</i> <i>Federal government (SEDATU)</i>		X		Communities expect and demand CBR to solve the conflicts There is a tendency to hold the others responsible for the irresolution of conflicts
Main obstacles for conflict management	<i>Predominance of conservation interest</i> <i>CBR not giving titles</i>		<i>Lack of local and political will</i> <i>Third party's involvement</i> <i>Institutional constraints</i>		X		Neither party acknowledges itself as a hinderer of conflict management
Interest over territory and natural resources	<i>Use and conservation</i>		<i>Conservation and regulated use</i> <i>Acknowledgement of local livelihoods need</i>		X		Opposite prioritization of interests (use and preservation) Even though there is a recognition of the need to fulfill local livelihoods, there is a message of not using natural resources

Need of conservation	<i>Yes, for livelihoods</i>	<i>Yes, for preserving biodiversity</i>	X			This is the only topic in which parties agree, though the reasons for these opinions differ
Alternative for managing the conflict	<i>CBR enabling productive activities and providing opportunities for development</i>	<i>Compensation and ecotourism in CN</i>			X	In principle, aims are shared (to foster community development, to enable titling), but contextual elements hinder the implementation of these resolutions, which exceed direct stakeholders' attributions
	<i>CBR enabling titling</i>	<i>Disincorporation of ELS from the reserve's polygon</i>				
	<i>Compensation for conservation from government</i>					

4. Discussion

Even when we found the primacy of a lack of shared understanding among the parties, we could determine that the existence or not of this shared understanding might not be a determining factor for conflict management, in situation where conflict resolution demands actions that exceed main stakeholders' attributions. While a shared understanding does help the global process of conflict management, i) the local impairment resulting from the exclusionary creation and operation of protected areas, and ii) the lack of clarity regarding stakeholders' scope of action, represent significant hinderers in conflict management. We discuss the elements that led to these main results, according to stakeholders' perspectives and the existence or not of a shared understanding among them.

4.1. Stakeholders' perspectives on conflict and its management

Conflict definition

Conflicts in both case studies mainly regard restrictions to local livelihoods on part of the CBR. Impact to livelihoods has been identified as one of the main impacts of protected areas on local populations (Clements et al., 2014; Woodhouse et al., 2015), which has previously been reported for Calakmul (Ericson, 2006; Sosa-Montes et al., 2012). A lack of prior consultation with local communities for the establishment of the reserve has resulted in local people holding an impairment feeling (Durand et al., 2015; de Pourcq et al., 2015), which does not seem to diminish over the years, especially in ELS, where people have had no land titles for 20 years now. On the contrary, time seems to have increased the impairment feeling, mining the local willingness to collaborate with the reserve (García-Frapolli, 2015; Mathevet et al., 2016), after a history of broken promises and development projects' failure.

Conflict responsibility

There is no shared understanding on the allocation of responsibilities regarding conflict resolution. On the one hand, CBR and agrarian authorities both argue that land titling in the case of ELS is not their responsibility. On the other hand, local communities acknowledge the CBR as responsible for conflict resolution. However, political and bureaucratic obstacles result in CBR not having enough power to solve conflicts, as is the case in other protected areas (Oliva et al., 2019; Karst and Nepal 2019). Local communities lack a precise understanding of governmental institutions' attributions and functions. This leads to a simplistic blaming of these actors, perceived as more powerful, for the irresolution of conflicts, without acknowledging their actual attributions and limitations.

Exclusion and willingness to collaborate

Even if there is an official recognition of the imposition process by which the CBR was established, as well as the existence of an agrarian historical debt, there is not necessarily the acknowledgement on the part of the CBR of its current exclusionary and top-down operation (Ruiz-Mallén et al., 2015a). Achieving a level of local participation that encompasses the power for decision making, increasingly acknowledged as necessary for conservation (Ruiz-Mallén et al., 2014; Karst and Nepal 2019) and key to biosphere reserves' effectiveness (Oldekop et al., 2015; Cuong et al., 2017; Engen et al., 2018), seems to be a very distant goal to reach (Durand et al., 2014). This represents a significant obstacle for collaboration with local communities and reaffirms the commonly found lack of social acceptance of protected areas (Therville et al., 2018).

In our study communities, the willingness to engage in dialogue is subject to certain conditions and tied to each stakeholder's perspective on the conflict. The existence of such a willingness might be explained by the ineluctable coexistence of the reserve and the communities, given that they share the same territory, where conservation and local use interests converge (Oliva et al., 2019). In this sense, the reserve's administration acknowledges that local people have a determinant role in conserving/depleting natural resources (Carmen et al., 2015). We found a local willingness to engage in dialogue and collaboration with the reserve. However, this willingness is not

granted, but conditioned to feasible solution proposals from the reserve's part. Due to tiredness over numerous projects' failure in the past, local people seem to be more selective regarding proposals they would endorse.

Demand for compensation

The communities' demand for compensation from the government is based on i) the lack of prior consultation of when the reserve was established (Hernes and Metzger, 2017; Masterson et al., 2019); and ii) the conservation of forests that communities currently carry out on their lands. These arguments appear valid when considering that biosphere reserves aim at fostering local development (UNESCO, 1996; Therville et al., 2018), and the acknowledgement that economic incentives are required to promote local collaboration in protected areas (Soliku and Schraml, 2018; Ward et al., 2018). Additionally, people in communities argue that benefits from local conservation are perceived at a higher scale (Wünscher and Engel 2012; Dower, 2015), for which they should receive economic revenue. Costs of conservation are frequently locally assumed under the form of livelihood restrictions (Miller, 2013; Dower, 2015; Anderson et al., 2016). A more even distribution of conservation costs and benefits would address this local impairment, also being a way to tackle social injustices that remains a challenge in protected areas (Therville et al., 2018).

The fact that plot size influences local perceptions of the feasibility of conservation is related to the local conception of conservation as opposed to use. Such conception hinders conflict management, as it establishes a negative attitude towards conservation, having been identified as a stressor (Ruiz-Mallén et al., 2015a) and an impediment to livelihoods.

It has been said that biosphere reserves' administrations do not adequately consider the means for local populations to develop alternative livelihoods (Bennett and Dearden, 2014). However, it is difficult for biosphere reserves to operate in ways that are more socially linked (e.g., by complying with productive activities locally expected) due to bureaucracy and financial constraints faced by protected areas in Mexico (García-Frapolli

et al., 2009; CONANP, 2018). In this regard, a local understanding of these institutional operational limitations could improve the conflict management process. As Peet and Watts (1996) have suggested, in developing countries environmental problems are not as related to deficient management but to political and economic constraints. Lack of financial resources is still found as one of the major effectiveness limitations for protected areas (Peres, 2011; Oliva et al., 2014; Cuong et al., 2017).

Conflict management alternatives

Legal support is a strategy followed by communities to resist protected areas (Holmes, 2013) and has been used to manage conflicts (Baynham-Herd et al., 2018). In the case of CN, despite having “legal protection” (*juicio de amparo* -won the lawsuit), they still face a conflict related to the perceived impairment on their natural resource use. This shows that solving the legal aspect of a conflict does not necessarily mean that the conflict is solved (Trouwborst, 2015). We consider that for ELS, a legal solution (i.e. obtaining land titles) would be a step forward for conflict management and the community wellbeing (Ruiz-Mallén et al., 2015b), by securing family’s land tenure - widely acknowledged as a cornerstone for conservation (Pacheco and Benatti 2015; Allendorf et al. 2018). However, it would not mean a resolution to the conflict since the community might still face restrictions on their livelihoods.

The primary strategy that the CBR proposed for solving the land issue in ELS was its disincorporation from the reserve’s area. This proposal was roundly discharged by CONANP because it goes against the federal conservation policy, aligned with Aichi Target 11, which aims at increasing the protected area surface nationwide (CBD 2011; CONANP 2016a). Subscription to the international conservation policy, adopted without adjustments to local contexts, is a hinderer for conflict management in our case studies, with consequences for conservation in the long run.

Cumming (2016) proposed re-evaluating socioecological conditions of protected areas to determine their pertinence. Applied to ELS, it would support the argument of disincorporation, as plots seem to no longer represent the ecological value that justifies

them as part of a biosphere reserve. However, this argument might be polemic, because it could lead to the intended depletion of natural resources inside protected areas in order to ask for disincorporation. Alike, it could foster the downsizing in other protected areas, contributing to protected area downgrading, downsizing, and degazetement (PADDD) (Mascia and Pailler, 2011), which is a process that has intensified over the last two decades (Golden-Kroner et al., 2019). However, the socioecological complexity of the conflict makes it necessary to discuss the convenience of this trade-off (i.e., downsizing a protected area for social benefit), especially considering that trade-offs tend to be the most feasible strategies for conflict management (Redpath et al., 2015a; Karst and Nepal, 2019).

4.2. Shared understanding and its utility for conflict management

The only aspect in which we found shared interests was the acknowledgement of the need for conserving biodiversity: local populations hold a willingness to maintain their environment and the reserve aims at preserving biodiversity. This scenario highlights that the conflict is not about different interests regarding conservation as a general idea (Holland, 2015), but about how to satisfy livelihoods without depleting ecosystems. This conservation–wellbeing binomial might be feasible through a balanced approach to natural resource use in protected areas (Cooper and Kainer, 2017). As has been proposed before, we highlight the utility of these shared views as starting points to develop conflict management processes (Marshall et al., 2007; Lecuyer et al., 2018).

Nevertheless, as we found only one aspect on which stakeholders agree, even when it should be taken as a starting point for dialogue and collaboration, it is necessary to address other aspects. Focusing on topics for which there is not a shared understanding (like conflict resolution responsibilities in our case studies) might be cornerstone in this context, given it represents one of the main hinderers in the conflict management process. Identifying disagreement among parties is relevant because this points to sensitive aspects that require special treatment (Marshall et al., 2007), such as those issues that hinder conflict management.

One of the main issues in which a shared understanding is needed in our case studies is on the actual attributions of parties involved in the conflict. For instance, we found that the lack of clarity regarding the reserve's attributions constituted a relevant hinderer in local people's understanding of the reserve administration's position and the alternatives they suggested for conflict management. Consequently, local people were not willing to negotiate as they blamed the reserve for not solving the conflict, and they assumed that the reserve had the power and faculties to do so (e.g., providing land titles to ELS). Being aware of the constraint's other parties face might improve parties' tolerance towards conflict management processes.

Shared understanding has been conceived as the level of agreement among stakeholders regarding what the conflict is about and how to manage it (Redpath et al., 2013; Young et al., 2016). From our findings, we suggest that it might be useful to conceive shared understanding not only as agreement on particular issues, but also as knowing the reasons underlying the position of the other party. In this sense, reaching a shared understanding would not necessarily be to say that parties reach a certain level of agreement (Redpath et al., 2013; Lecuyer et al., 2018). We suggest that efforts on improving a shared understanding, besides identifying the level of agreement, should focus on helping parties understand each other's position and the reasons behind those positions (e.g., institutional constraints protected areas face), concentrating on understanding what the other party is able and not able to do. This is particularly relevant for dealing with the blame being projected from one party to another (i.e., do I know what the other party is actually empowered to do?) and might help increase tolerance between parties.

5. Conclusions

We found that a shared understanding might not be determining for conflict management in protected areas when i) there has been an imposition or exclusionary process from the protected area, which derives in a persistent local impairment; and ii) stakeholders are not empowered or do not have the attributions to solve conflicts. On the other hand, when

dealing with protected areas that have been imposed and operate through exclusionary processes, it is worth questioning the demand for impaired populations to understand the position of those who have negatively affected their livelihoods. In this context, we highlight the importance of identifying key topics on which a shared understanding is needed in each singular conflict for advancing its management. Additionally, we propose that it might be useful to conceive shared understanding not only as a certain level of agreement among parties, but also as knowing the reasons why others adopt a certain position, since it might increase tolerance in the process of searching for solutions. Finally, we recommend that in the building of a shared understanding, the antecedent of the conflict (e.g., imposition of protected areas, distribution of conservation costs and benefits) it should be considered, as it is arguable that acknowledging this kind of issue would lay the groundwork for a more even negotiating process among the parties, hence, more effective management of the conflict.

Acknowledgements. The first author extends acknowledgment to the PhD Program in Sustainability Sciences, UNAM “Doctorado en Ciencias de la Sostenibilidad, Universidad Nacional Autónoma de México”, and a PhD scholarship received from CONACYT, Mexico. This work was supported by UNAM—PAPIIT [grant number IN302517]. We are very grateful to the people from study communities who participated and shared valuable information for this study.

Declarations of interest: none

6. References

- Allendorf, T.D, Swe, K.K., Aung, M., Thorsen, A., 2018. Community use and perceptions of a biodiversity corridor in Myanmar's threatened southern forests. *Global Ecology and Conservation* 15 (2018) e00409
- Anderson, M.W., Teisl, M.F., Noblet, C.L., 2016. Whose values count: is a theory of social choice for sustainability science possible? *Sustainability Science* 11, 373–383.

- Baynham-Herd, Z., Redpath, S., Bunnefeld, N., Molony, T., Keane, A. 2018. Conservation conflicts: Behavioural threats, frames, and intervention recommendations. *Biological Conservation* 222, 180–188.
- Bennett, N.J., Dearden, P. 2014. Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy* 44, 07–116.
- Bennett, N.J., 2016. Using perceptions as evidence to improve conservation and environmental management. *Conservation Biology* 30, 582–592.
- Bouamrane, M., M. Spierenburg, A. Agrawal, A. Boureima, M.C. Cormier-Salem, M. Etienne, C. Le Page, H. Levrel, Mathevet, R., 2016. Stakeholder engagement and biodiversity conservation challenges in social-ecological systems: some insights from biosphere reserves in western Africa and France. *Ecology and Society* 21(4):25.
- Bryman, A., 2001. Interviewing in qualitative research. *Social research methods*. Oxford University Press. Nueva York, Estados Unidos de América.
- Carmen, E., Young, J.C., Watt, A., 2015. Linking conflict and global biodiversity conservation policies, in: Redpath, S.M., Gutiérrez, R.J., Wood, K.A., Young, J.C. (Eds.), *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press. British Ecological Society, United Kingdom, pp. 180–192.
- CBD, 2011. Aichi Biodiversity Targets. <https://www.cbd.int/sp/targets/> Consulted: 21 March 2017.
- Chamberlain, E.C., Rutherford, M.B., Gibeau, M.L., 2012. Human Perspectives and Conservation of Grizzly Bears in Banff National Park, Canada. *Conservation Biology* 26, 420–431.
- Clements, T., Soun, S., Wilkie, D.S., Milner-Gulland, E.J., 2014. Impacts of protected areas on local livelihoods in Cambodia. *World Development* 64, 125–134.
- CONANP, 1999. Programa de Manejo de la Reserva de la Biosfera Calakmul, México. Instituto Nacional de Ecología. D.F., México.

- CONANP, 2015. Estudio Previo Justificativo para la modificación de la declaratoria de la Reserva de la Biosfera Calakmul, Campeche. 118 pp.
- CONANP, 2018. Informe de rendición de cuentas de conclusión de la administración 2012-2018. Comisión Nacional de Áreas Naturales Protegidas. <https://www.conanp.gob.mx/InformeRendicion/InformeConsolidado.pdf> (Consulted 10 April 2019).
- Cooper, N.A., Kainer, K.A., 2017. To log or not to log: local perceptions of timber management and its implications for well-being within a sustainable-use protected area. *Ecology and Society* 23, 4.
- Cumming, G.S., 2016. The relevance and resilience of protected areas in the Anthropocene. *Anthropocene* 13, 46–56.
- Cuong, C.V., Dart, P., Hockings, M., 2017. Biosphere reserves: Attributes for success. *Journal of Environmental Management* 188, 9–17.
- de Pourcq, K., Thomas, E., Arts, B., Vranckx, A., León-Sicard, T., Van Damme, P., 2015. Conflict in Protected Areas: Who Says Co-Management Does Not Work? *PLoS ONE* 10(12): e0144943. doi:10.1371/journal.pone.0144943
- Dower, N. 2015. Conservation conflicts: ethical issues, in: Redpath, S.M., Gutiérrez, R.J., Wood, K.A., Young, J.C. (Eds.), *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press. British Ecological Society, United Kingdom, pp. 137–151.
- Durand, L., Figueroa, F., Trench, T., 2014. Inclusion and Exclusion in Participation Strategies in the Montes Azules Biosphere Reserve, Chiapas, Mexico. *Conservation and Society* 12, 175–189.
- Durand, L., Figueroa, F., Trench, T., 2015. Inclusión, exclusión y estrategias de participación en la reserva de la biosfera Montes Azules (Chiapas), in: Durand, L., Figueroa, F., Guzmán, M. (Eds.), *La naturaleza en contexto. Hacia una ecología política mexicana*. Colección Alternativas, México, pp. 237–267.

- Engen, S., Runge, C., Brown, G., Fauchald, P., Nilsen, L., Hausner, V., 2018. Assessing local acceptance of protected area management using public participation GIS (PPGIS). *Journal for Nature Conservation* 43, 27–34.
- Ericson, J.A., 2006. A participatory approach to conservation in the Calakmul Biosphere Reserve, Campeche, Mexico. *Landscape and Urban Planning* 74, 242–266.
- Frankfort-Nachmias, Ch., Leon-Guerrero, A., 2009. *Social Statistics for a Diverse Society*. 5th ed. Pine Forge, United States of America.
- Galindo-Leal, C., 1999. La gran región de Calakmul: prioridades biológicas de conservación y propuesta de modificación de la Reserva de la Biosfera. Reporte Final a World Wildlife Fund - México. México, D.F.
- García-Frapolli, E., 2015. Exclusión en Áreas Naturales Protegidas: una aproximación desde los programas de manejo, in: Durand, L., Figueroa, F., Guzmán, M. (Eds.), *La naturaleza en contexto. Hacia una ecología política mexicana*. Colección Alternativas, México, pp. 221–236.
- García-Frapolli, E., Ramos-Fernández, G., Galicia, E., Serrano, A., 2009. The complex reality of biodiversity conservation through Natural Protected Area policy: Three cases from the Yucatan Peninsula, Mexico. *Land Use Policy* 26, 715–722.
- Golden-Kroner, R.E., Qin, S., Cook, C.N., Krithivasan, R., Pack, S.M., Bonilla, O.D., Cort-Kansinally, K.A., Coutinho, B., Feng, M., Martínez-García, M.I., He, Y., Kennedy, C.J., Lebreton, C., Ledezma, J.C., Lovejoy, T.E., Luther, D.A., Parmanand, Y., Ruíz-Agudelo, C.A., Yerena, E., Morón-Zambrano, V., Mascia, M.B., 2019. The uncertain future of protected lands and waters. *Science* 364, 881–886.
- Hernes, M.I., Metzger, M.J., 2017. Understanding local community's values, worldviews and perceptions in the Galloway and Southern Ayrshire Biosphere Reserve, Scotland. *Journal of Environmental Management* 186, 12–23.
- Holland, A., 2015. Philosophy, conflict and conservation, in: Redpath, S.M., Gutiérrez, R.J., Wood, K.A., Young, J.C. (Eds.), *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press. British Ecological Society, United Kingdom, pp. 19–32.

- Holmes, G., 2013. Exploring the Relationship Between Local Support and the Success of Protected Areas. *Conservation and Society* 11, 72–82.
- INEGI, 1996. Plano producido para el Registro Agrario Nacional. Ejido NCPE Centauro del norte, Clave 103.
- INEGI, 2010. Censo de Población y Vivienda 2010. http://www3.inegi.org.mx/sistemas/iter/entidad_indicador.aspx?ev=5. (Consulted 17 April 2016).
- Karst, H. E., Nepal, S. K., 2019. Conservation, development and stakeholder relations in Bhutanese protected area management. *International Journal of Sustainable Development & World Ecology* 26, 290–301.
- Lecuyer, L., White, R.M., Schmook, B., Calmé, S., 2018. Building on common ground to address biodiversity conflicts and foster collaboration in environmental management. *Journal of Environmental Management* 220, 217–226.
- Marshall, K., White, R., Fischer, A., 2007. Conflicts between humans over wildlife management: on the diversity of stakeholder attitudes and implications for conflict management. *Biodiversity Conservation* 16, 3129–3146.
- Mascia, M.B., Pailler, S., 2011. Protected area downgrading, downsizing, and degazettement (PADDD) and its conservation implications. *Conservation Letters* 4, 9–20.
- Masterson, V.A., Spierenburg, M., Tengö, M., 2019. The trade-offs of win-win conservation rhetoric: exploring place meanings in community conservation on the Wild Coast, South Africa. *Sustainability Science* 14, 639–654.
- Mathevet, R., Thompson, J.D., Folke, C., Chapin, F.S., 2016. Protected areas and their surrounding territory: socioecological systems in the context of ecological solidarity. *Ecological Applications* 26, 5–16.
- Miller, T.R., 2013. Constructing sustainability science: emerging perspectives and research trajectories. *Sustainability Science* 8, 279–293.
- Newing, H., 2011. *Conducting Research in Conservation. A Social Science Perspective*, ed. Routledge, New York.

- Oldekop, J.A., Holmes, G., Harris, W.E., Evans, K.L., 2015. A global assessment of the social and conservation outcomes of protected areas. *Conservation Biology* 30, 133–141.
- Oliva, M., García-Frapolli, E., Porter-Bolland, L., Montiel, S., 2019. Early Detection of Conflicts for the Management of Protected Areas: The Case of Charcoal Production in the Los Petenes Biosphere Reserve, Mexico. *Environmental Management* 64, 52–63.
- Oliva, M., Montiel, S., García, A., Vidal, L., 2014. Local perceptions of wildlife use in Los Petenes Biosphere Reserve, Mexico: Maya subsistence hunting in a conservation conflict context. *Tropical Conservation Science* 7, 781–795.
- Pacheco, P., Benatti, J.H., 2015. Tenure Security and Land Appropriation under Changing Environmental Governance in Lowland Bolivia and Pará. *Forests* 6, 464–491.
- Peet, R., Watts, M., 1996. Liberation Ecology. Development, sustainability, and environment in an age of market triumphalism, in: Peet, R., Watts, M. (Eds.), *Liberation Ecologies. Environment, development, social movements*. Routledge, London and New York, pp. 1–45.
- Peres, C.A., 2011. Conservation in sustainable-use tropical forest reserves. *Conservation Biology* 25, 1124–1129.
- Periódico Oficial, 2000. Aviso de Deslinde de Terreno de Presunta Propiedad Nacional, 21 de septiembre de 2000. San Francisco de Campeche, Campeche.
- Porter-Bolland L., García-Frapolli, E., Sánchez-González, M.C., 2013. Local perceptions of conservation initiatives in the Calakmul Region, in: Porter-Bolland, L., Ruiz-Mallén, I., Camacho-Benavides, C., McCandless, S.R. (Eds.), *Community Action for Conservation: Mexican Experiences*, DOI 10.1007/978-1-4614-7956-7_6, © Springer Science+Business Media New York, 83–100.
- Redpath, S.M., Gutiérrez, R.J., Wood, K.A., Young, J.C., 2015a. Finding a way out of conservation conflicts, in: Redpath, S.M., Gutiérrez, R.J., Wood, K.A., Young, J.C. (Eds.), *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press. British Ecological Society, United Kingdom, pp. 287–303.

- Redpath, S.M., Gutiérrez, R.J., Wood, K.A., Sidaway, R., Young, J.C., 2015b. An introduction to conservation conflicts, in: Redpath, S.M., Gutiérrez, R.J., Wood, K.A., Young, J.C. (Eds.), *Conflicts in conservation. Navigating towards solutions*. Cambridge University Press. British Ecological Society, United Kingdom, pp. 3–18.
- Redpath, S.M., Young, J., Evely, A., Adams, W.M., Sutherland, W.J., Whitehouse, A., Amar, A., Lambert, R.A., Linnell, J.D.C., Watt, A., Gutiérrez, R.J., 2013. Understanding and managing conservation conflicts. *Trends in Ecology & Evolution* 28, 100–109.
- Ruiz-Mallén, I., Corbera, E., Calvo-Boyer, D. & Reyes-García, V., Brown, K., 2015a. How do biosphere reserves influence local vulnerability and adaptation? Evidence from Latin America. *Global Environmental Change* 33, 97–108.
- Ruiz-Mallén, I., Corbera, E., Calvo-Boyer, D., Reyes-García, V., 2015b. Participatory scenarios to explore local adaptation to global change in biosphere reserves: Experiences from Bolivia and Mexico. *Environmental Science & Policy* 54, 398–408.
- Ruiz-Mallén, I., Newing, H., Porter-Bolland, L., Pritchard, D.J., García-Frapolli, E., Méndez-López, M.E., Sánchez-Gonzalez, M.C., De La Peña, A., Reyes-García, V., 2014. Cognisance, participation and protected areas in the Yucatan Peninsula. *Environmental Conservation* 41, 265–275.
- Soliku, O., Schraml, U., 2018. Making sense of protected area conflicts and management approaches: A review of causes, contexts and conflict management strategies. *Biological Conservation* 222, 136–145.
- Sosa-Montes, M., Durán-Ferman, P., Hernández-García, M.A., 2012. Relaciones socioambientales entre comunidades y áreas naturales protegidas. Reserva de la Biosfera Calakmul: entre el conflicto y la conservación. *Revista Chapingo Serie Ciencias Forestales y del Ambiente* 18, 111–121.
- Therville, C., Mathevet, R., Bioret, F., Antona, M., 2018. Navigating protected areas as social-ecological systems: integration pathways of French nature reserves. *Reg. Environ. Change*, 18:607–618.
- Trouwborst, A., 2015. Law and conservation conflicts, in: Redpath, S.M., Gutiérrez, R.J., Wood, K.A., Young, J.C. (Eds.), *Conflicts in conservation. Navigating towards*

- solutions. Cambridge University Press. British Ecological Society, United Kingdom, pp. 108–121.
- UNESCO, 1996. Biosphere reserves: the Seville strategy and the statutory framework of the World Network. UNESCO, Paris, France. [online] URL: <http://unesdoc.unesco.org/images/0010/001038/103849Eb.pdf> (Consulted 23 November 2018).
- Ward, C., Holmes, G., Stringer, L., 2018. Perceived barriers to and drivers of community participation in protected-area governance. *Conservation Biology* 32, 437–446.
- Woodhouse E., Bedelian C., Dawson N., Barnes P., 2018. Social impacts of protected areas: exploring evidence of trade-offs and synergies, in: Schreckenberg, K., Mace, G., Poudyal, M. (Eds.), *Ecosystem Services and Poverty Alleviation: Trade-offs and Governance*. Routledge, New York, pp. 222–240.
- Woodhouse, E., Homewood, K.M., Beauchamp, E., Clements, T., McCabe, J.T., Wilkie, D. & Milner-Gulland, E.J., 2015. Guiding principles for evaluating the impacts of conservation interventions on human well-being. *Phil. Trans. R. Soc. B* 370: 20150103. <http://dx.doi.org/10.1098/rstb.2015.0103>
- Wünscher, T., Engel, S., 2012. International payments for biodiversity services: Review and evaluation of conservation targeting approaches. *Biological Conservation* 152, 222–230.
- Young, J.C., Marzano, M., White, R.M., McCracken, D.I., Redpath, S.M., Carss, D.N., Quine, C.P., Watt, A.D., 2010. The emergence of biodiversity conflicts from biodiversity impacts: characteristics and management strategies. *Biodiversity and Conservation* 19, 3973–399.
- Young, J.C., Searle, K., Butler, A., Simmons, P., Watt, A.D., Jordan, A., 2016. The role of trust in the resolution of conservation conflicts. *Biological Conservation* 195, 196–202.

CAPÍTULO 5. DISCUSIÓN

It takes concrete histories to make any concept come to life.

Anna L. Tsing

-The Mushroom at the End of the World, 2015-

En esta tesis se mapearon tres conflictos de conservación, uno en la RBLP y dos en la RBC. Para dar respuesta a nuestra primera pregunta de investigación, identificamos los elementos que inciden en el éxito o fracaso del manejo de dichos conflictos. Atendiendo a nuestra segunda pregunta, reflexionamos sobre los motivos por los que las RB continúan ocasionando conflictos de conservación a pesar de tener el objetivo expreso de involucrar a las poblaciones locales y promover su desarrollo. En este capítulo se discute sobre los principales hallazgos de la investigación a la luz de la literatura actual para, a partir de ello, generar aportes al debate sobre conflictos de conservación. Esta tesis contribuye al campo de manejo de conflictos de conservación en ANP, campo emergente y de creciente relevancia (UNESCO 1996, Redpath et al. 2013, Soliku & Schraml 2018), en términos del abordaje de los principales desafíos que enfrentan 1) los administradores de las RB, al establecer acciones para lograr sus objetivos de conservación y desarrollo, que permitan un tránsito hacia escenarios sostenibles, y 2) las poblaciones locales cuyos medios de vida se ven afectados.

Podemos clasificar los obstáculos para el manejo de conflictos de nuestros casos de estudio en aquellos relacionados con i) aspectos institucionales y de política pública de conservación, o bien con ii) las perspectivas de las partes. La literatura sobre conflictos en ANP ha identificado previamente la influencia de ambos temas en la ocurrencia y manejo de conflictos de conservación (West et al. 2006, Allendorf 2007, Redpath et al. 2013, Clements et al. 2014, Durand et al. 2015, de Pourcq et al. 2017, MacKenzie et al. 2017, Soliku & Schraml 2018, Hodgson et al. 2019).

5.1. Obstáculos para el manejo de conflictos

5.1.1. La política pública y aspectos institucionales

En países del Sur Global, las alternativas de manejo de conflictos que han resultado más efectivas incluyen la promoción de alternativas de vida para las poblaciones locales afectadas por ANP, así como su mayor participación en el manejo y la incorporación del conocimiento local en dicho manejo (Soliku & Schraml 2018). A pesar de ello, continúan habiendo deficiencias en la incorporación efectiva de la participación local, así como de prácticas productivas locales (Assefa & Hans-Rudolf 2017, Eastwood et al. 2017). Esto lo apreciamos en los casos de Calakmul, con la operación excluyente de la RBC, y en Los Petenes, donde el marco legal y las autoridades de la reserva descartan la práctica local de producción de carbón vegetal, aún sin contar con evidencia científica del impacto o sostenibilidad de la actividad. La toma de decisiones sin evidencia científica, misma que resulta clave para el manejo de conflictos (Redpath & Sutherland 2015), impide el establecimiento de medidas de manejo con impacto social reducido como, por ejemplo, la definición de tasas de aprovechamiento sustentables de la vegetación utilizada para producir carbón (Mohibbi & Cochard 2014), que permitan la coexistencia de metas de conservación y bienestar local.

Otro de los obstáculos que continúa siendo identificado como uno de los principales impedimentos para la implementación efectiva de RB, es la falta de recursos financieros (Peres 2011, Oliva et al. 2014, Cuong et al. 2017). Tanto en la RBLP como en la RBC, la insuficiencia de recursos financieros que el sector ambiental ha sufrido en México en los últimos años afecta su operación, la promoción del desarrollo local y el involucramiento local efectivo. A esto se suma el centralismo, burocracia y limitantes institucionales para la efectiva implementación de la política de conservación en México (García-Frapolli et al. 2009, Challenger et al. 2018), que hacen de la operación socialmente vinculada de las ANP un desafío mayor. Tal desafío se ve reflejado, por ejemplo, en la dificultad de las administraciones de RB de abordar las necesidades y expectativas locales propias de cada contexto (e.g., alternativas económicas que las comunidades desean desarrollar), y al mismo tiempo atenerse a las pautas regulatorias y operativas de

CONANP-central que, a su vez, están alineadas con la política internacional de conservación (i.e., Metas de Aichi) (CONANP 2016a, Challenger et al. 2018).

México es signatario del Convenio sobre Diversidad Biológica, lo que ha llevado a que la política pública nacional de conservación mediante ANP esté directamente ligada a las directrices que este convenio establece. Un claro ejemplo de ello es la adopción de la Meta 11 de Aichi en el Programa Nacional de Áreas Naturales Protegidas, mismo que plantea el objetivo de incrementar la superficie nacional bajo ANP para 2020, así como el cumplimiento de compromisos internacionales asumidos por el país (SEMARNAT 2014). La Meta 11 de Aichi ha sido aplicada por diversos países con una perspectiva cuantitativa, centrándose en indicadores de superficie (Visconti et al. 2019). Esta Meta ha tenido un efecto criminalizador de la reducción de superficie de ANP, lo que, por ejemplo, en el caso de ELS, ha actuado como un impedimento tajante para el manejo del conflicto (i.e., rechazar la desincorporación de la comunidad del polígono de la reserva). De esta forma vemos cómo instrumentos de política internacional (i.e., Convenio sobre Diversidad Biológica y sus Metas de Aichi), aunque surgen a una escala global, tienen repercusiones significativas a niveles locales, lo que muestra cómo el contexto de la política internacional afecta a la práctica de conservación en contextos específicos (Martens 2006, Leenhardt et al. 2013).

Más allá del incremento de la superficie bajo protección, incluso desde antes de las Metas de Aichi, se ha resaltado la importancia de la efectividad e implementación adecuada de RB y otras ANP (Dudley et al. 2004, Oliva et al. 2014, UNESCO 2016). La misma Meta 11 contempla también que las ANP deben ser manejadas efectiva y equitativamente, cubriendo así aspectos del bienestar de las poblaciones asociadas (CBD 2011). Ante esto, una interpretación integral de la Meta, que considere la superficie de ANP siempre y cuando cumpla con criterios de efectividad en el manejo, redundaría en promover la implementación efectiva de estas áreas y desmotivaría la creación de “parques de papel” (Visconti et al. 2019), sirviendo de mejor manera a fines de conservación y bienestar social. A través de los ejemplos de Los Petenes, donde el marco legal obstaculiza el principal medio de vida local (i.e., producción de carbón vegetal), y la

Meta 11 de Aichi que impide avanzar en la solución del conflicto en ELS, vemos cómo la política pública desvinculada de contextos locales entorpece el manejo de conflictos de conservación en reservas de la biósfera.

Las diferencias en las escalas también se manifiestan al hablar de los costos y beneficios de la conservación, cuya desigual distribución es una de las causas de conflictos socioambientales a nivel global (Wünscher & Engel 2012, Dower 2015, Engen et al. 2019). En nuestros casos de estudio, la percepción local de esta relación desigual, donde existe una asunción local de los costos de conservación (Miller 2013, Dower 2015, Anderson et al. 2016, Engen et al. 2019) por el mantenimiento de las selvas, está fuertemente arraigada, y permea la posición de las comunidades locales en el manejo de conflictos. Una distribución más equitativa de los costos y beneficios de la conservación abordaría la demanda local de una compensación por la conservación *de facto* que las comunidades llevan a cabo (Engen et al. 2019), al mismo tiempo que abordaría los aspectos de injusticia social, que continúan siendo un desafío en las áreas protegidas (Therville et al. 2018, Lecuyer et al. 2018).

Sobre las formas convencionales de compensación por los impactos sociales en ANP (e.g., pago por servicios ambientales, ecoturismo), se ha señalado una consideración insuficiente de los valores culturales de las poblaciones locales (Masterson et al. 2019). Se ha sugerido también que, particularmente en paisajes tropicales, el alcance de resultados sostenibles de conservación requiere de enfoques situados (Boedhihartono et al. 2018), especialmente si consideramos que las estrategias de vida de la gente buscan estar ligadas a su historia étnica y política (Tsing 2015). La implementación de propuestas de compensación sin consultar los intereses y expectativas de la población local sobre las actividades que están dispuestos a desarrollar da como resultado una historia de intentos fallidos de proyectos productivos y/o de desarrollo local, tal como se ha visto en otros casos y se confirma en lo expresado por los entrevistados en las tres comunidades de estudio (Bologna & Spierenburg 2015). Tales antecedentes de intervenciones poco efectivas, que pueden exacerbar los problemas existentes (Bulte & Rondeau 2007), condicionan la disposición local a colaborar con las RB.

Cabe preguntarse, si es tan ampliamente reconocido ¿por qué las RB no implementan proyectos de desarrollo localmente deseados, por ende, más viables? Una posible respuesta tiene que ver con la dificultad para operacionalizar principios de manejo, como la participación (Eastwood et al. 2017) o el desarrollo local, debido a la falta de condiciones habilitantes. Reaparecen aquí las limitantes derivadas del carácter centralista de la política de conservación, que define las vías, rubros y acciones de apoyo a aplicarse en todo el territorio nacional. Así, las RB deben maniobrar con los —decrecientes— recursos financieros (CONANP 2018) y humanos de que disponen, bajo programas con objetivos de apoyo ya definidos, que no necesariamente coinciden con las expectativas o necesidades locales (Durand & Figueroa 2014). Ante este escenario, para hacer un uso más eficiente de los limitados recursos disponibles, la consulta a comunidades para planificar las formas de impulsar el desarrollo local resultará clave para que esas iniciativas gocen del apoyo local (Nautiyal 2011) y tengan mayores probabilidades de éxito.

En este mismo sentido, destaca también como obstáculo el que los proyectos de conservación, como RB, no contemplan de manera paralela proyectos de desarrollo u otras acciones para promover el bienestar local. La falta de consideración de factores sociales como i) resolver los asuntos de tenencia de la tierra en El Sacrificio, ii) la construcción de alternativas económicas viables en Centauro del Norte y iii) el desarrollo de actividades productivas vigentes de relevancia local como el carbón vegetal en Los Petenes, atenta contra el bienestar local y se traduce en serios impedimentos para el manejo de conflictos.

5.1.2. Las perspectivas locales

El reconocimiento de las diferentes perspectivas, especialmente de los actores locales, ha sido reconocido como un factor de suma relevancia para alcanzar metas de conservación (Martín-López & Montes 2015, Bennett 2016, Engen et al. 2019) y para el manejo de los conflictos de conservación (Redpath et al. 2013, Stepanova et al. 2019). Por ello, la persistencia del sentimiento de menoscabo por parte de las poblaciones locales resulta un

obstáculo significativo al manejar conflictos. Tal menoscabo no es fácilmente superado con mecanismos que intentan paliar el impacto social generado, por ejemplo, con subsidios o procesos de participación donde los actores locales no tienen poder de decisión ni incidencia en el manejo (Durand et al. 2015, Young et al. 2016b, Eastwood et al. 2017).

La construcción de confianza entre actores, particularmente mediante procesos de participación justa, ha mostrado favorecer el manejo de conflictos (Young et al. 2016b). En el sentido opuesto, la historia de desconfianza en el manejo de reservas y la persistencia del menoscabo local, como se observó en las comunidades de estudio, influye fuertemente en la inexistencia de un entendimiento compartido. Sin embargo, parecería que el entendimiento compartido, identificado como un elemento clave para el manejo exitoso de conflictos (Redpath et al. 2013), no es determinante para su resolución cuando las partes no cuentan con el poder para realizar las acciones necesarias para tal fin (por ejemplo, cuando existen obstáculos legales o limitantes financieras).

5.2. Coadyuvantes para el manejo de conflictos de conservación

Por otra parte, respecto a los elementos que contribuyen al manejo de conflictos, en esta investigación se identificaron dos elementos importantes: i) el interés compartido por la conservación y ii) la importancia de la detección temprana de conflictos potenciales. Coincidiendo con la tendencia de comunidades rurales a nivel global (Wali et al. 2017), las poblaciones locales en las RBLP y RBC tienen un interés por conservar los recursos naturales, base de sus medios de vida. A pesar de este interés compartido con las administraciones de ambas RB, continúa siendo un desafío llegar a acuerdos sobre cómo conciliar los medios de vida locales con el mantenimiento de los valores ecológicos. En este sentido, sugerimos que la búsqueda de alternativas de medios de vida se realice enfatizando la viabilidad local de su implementación. Al decir viabilidad, nos referimos a que las actividades a impulsar sean localmente deseadas y factibles de desarrollar en las condiciones existentes, o bien en condiciones plausibles de alcanzar. Asimismo, la búsqueda de alternativas necesariamente deberá hacerse de manera conjunta con las poblaciones involucradas.

El abordaje temprano de conflictos potenciales presenta ventajas para el manejo, que se pueden sintetizar en la reducción de la incertidumbre (Jerneck et al. 2011), al permitir 1) la colecta de información sobre el conflicto (respondiendo al problema de la ausencia de evidencia científica), 2) desarrollar procesos de actores con las partes involucradas desde antes que el conflicto estalle, y 3) tomar mejores decisiones con base en la información colectada. Asimismo, permite reemplazar los enfoques y acciones correctivos y compensatorios que generalmente se aplican en el abordaje de conflictos.

5.3. La continua emergencia de conflictos de conservación en reservas de la biósfera

A pesar de que las RB, por su objetivo dual de conservación y desarrollo, tendrían el potencial de evitar o abordar de manera más efectiva los conflictos de conservación, desde hace cerca de una década se ha identificado que estas áreas protegidas no han sido efectivas en buscar alternativas para favorecer el desarrollo económico, la equidad social y la sostenibilidad de los recursos naturales (Halffter 2011, Redpath et al. 2013). Los hallazgos de este estudio coinciden con lo previamente reportado acerca de la necesidad de mejorar la implementación de la figura de RB (Halffter 2011, Elbakidze et al. 2013, Oliva et al. 2016, UNESCO 2016, Cuong et al. 2017, 2018). Para ello, es fundamental el involucramiento (Ward et al. 2018) y trabajo colaborativo con agentes locales (Redpath et al. 2015a), orientado a que las comunidades establezcan sus propios caminos de desarrollo, en vez de que estos sean decididos desde afuera y las comunidades los sigan pasivamente (Elbakidze et al. 2013, Cuong et al. 2017, 2018, Ward et al. 2018).

5.4. Conclusiones

El presente trabajo permitió identificar los principales factores asociados al manejo de conflictos de conservación en el contexto de dos reservas de la biósfera de la Península de Yucatán. Uno de los principales hallazgos muestra que la política pública desvinculada de los contextos socioecológicos en que se aplica representa un obstáculo significativo en los procesos de manejo de conflictos. Esto se observó en los casos de Los Petenes, donde la ley forestal (LGDFS 2018) impide la práctica productiva local de mayor relevancia para el

sustento familiar (la producción de carbón vegetal), dificultando al mismo tiempo su manejo regulado, y de El Sacrificio, donde la adopción de las Metas de Aichi, por México, se convirtió en un impedimento para obtener certidumbre sobre la tenencia de la tierra. Otro de los obstáculos identificado para el manejo de conflictos se refiere a las dificultades para superar el sentimiento de menoscabo mantenido por las poblaciones locales como consecuencia de la imposición del área protegida (en el caso de Calakmul), así como de su operación excluyente y de las restricciones que la presencia de las reservas ha significado en el pasado e implica actualmente. La persistencia de dicho sentimiento local de menoscabo no ha logrado ser superado o compensado por los intentos de involucrar a las poblaciones en algunas acciones de manejo y conservación de las reservas. Tales medidas han tenido un carácter paliativo del impacto social ocasionado, sin alcanzarse la gobernanza efectiva de las reservas. Sin embargo, es importante resaltar que la implementación efectiva de procesos de involucramiento o participación enfrenta serios desafíos contextuales y operativos asociados al sector ambiental en México (e.g., escasez de recursos financieros y humanos), encontrados comúnmente en otros países del Sur Global.

De esta forma, se aprecia que los principales obstáculos en el manejo de conflictos de conservación se asocian en gran medida a la inexistencia de condiciones habilitantes (e.g., políticas, económicas, sociales), de una adecuada o efectiva implementación de la estrategia de reservas de la biósfera y las acciones planteadas para abordar los conflictos de conservación. En este mismo sentido, se encontró que aspectos sociales, tales como el entendimiento compartido entre las partes de un conflicto, parecería no ser determinante en el proceso de manejo de los conflictos, cuando los actores no cuentan con las atribuciones o el poder para llevar a cabo acciones claves para avanzar en la solución de dichos conflictos. Finalmente, considerando que el menoscabo local es difícilmente superado y que las condiciones contextuales favorables para el manejo de conflictos vigentes son elusivas, el abordaje temprano de conflictos de conservación potenciales representa ventajas significativas para un mejor manejo de las reservas, en la búsqueda de conciliar los medios de vida locales con metas de conservación. Este doble objetivo, en

el que se combinan el bienestar social y el mantenimiento de la biodiversidad y los ecosistemas, cada vez más aparece como una estrategia insoslayable en la búsqueda de trayectorias sostenibles y justas. Los conflictos de conservación, que comprometen el balance entre bienestar y conservación, seguirán ocurriendo en la medida que persista la implementación unilateral de metas de conservación, sea mediante reservas de la biósfera u otras regulaciones ambientales. La tensión entre intereses de preservación ambiental y de desarrollo local continuarán existiendo; el desafío radicará en el abordaje de estas tensiones, para lo que aproximaciones colegiadas entre los actores involucrados, mediadas por el respeto a los derechos de cada parte, resultarán un primer paso hacia una operación más efectiva de las estrategias conjuntas de conservación y desarrollo.

REFERENCIAS

- Allendorf, T.D. 2007. Residents' attitudes toward three protected areas in southwestern Nepal. *Biodiversity Conservation* 16, 2087–2102.
- Assefa, E. & Hans-Rudolf, B. 2017. Indigenous resource management practices in the Gamo Highland of Ethiopia: challenges and prospects for sustainable resource management. *Sustainability Science* 12, 695–709.
- Barnosky, A.D., Brown, J.H., Daily, G.C., Dirzo, R., Ehrlich, A.H., Ehrlich, P.R., Eronen, J.T., Fortelius, M., Hadly, E.A., Leopold, E.B., Mooney, H.A., Myers, J.P., Naylor, R.L., Palumbi, S., Stenseth, N.C. & Wake, M.H. 2013. Scientific Consensus on Maintaining Humanity's Life Support Systems in the 21st Century: Information for Policy Makers. Department of Integrative Biology and Museum of Paleontology, University of California-Berkeley.
- Belcher, B., Achdiawan, R. & Dewi, S. 2015. Forest-based livelihoods strategies conditioned by market remoteness and forest proximity in Jharkhand, India. *World Development* 66, 269–279.
- Boedhihartono, A.K., Bongers, F., Boot, R.G.A., van Dijk, J., Jeans, H., van Kuijk, M., Koster, H., Reed, J., Sayer, J., Sunderland, T., Turnhout, E., van Vianen, J. & Zuidema, P.A. 2018. Conservation Science and Practice Must Engage With the Realities of Complex Tropical Landscapes. *Tropical Conservation Science* 11, 1–7.
- Bologna, S.A. & Spierenburg, M. 2015. False legitimacies: the rhetoric of economic opportunities in the expansion of conservation areas in Southern Africa. In: van der Duim, V.R., Lamers, M.A.J. & van Wijk, J.J. (eds) *Institutional arrangements for conservation and tourism in Eastern and Southern Africa: a dynamic perspective*. Springer, Dordrecht, pp. 119–138.
- Bulte, E. & Rondeau, D. 2007. Compensation for wildlife damages: habitat conversion, species preservation and local welfare. *Journal of Environmental Economics and Management* 54, 311–322.

- CBD 2019. History of the Convention. <https://www.cbd.int/history/> Fecha de consulta: 03 de septiembre, 2019.
- Challenger, A., Cordova, A., Lazos Chavero, E., Equihua, M. & Maass, M. 2018. Opportunities and obstacles to socioecosystembased environmental policy in Mexico: expert opinion at the science-policy interface. *Ecology and Society* 23, 31.
- CONANP 2016a. http://www.conanp.gob.mx/que_hacemos/reservas_biosfera.php. Fecha de consulta: 12 de mayo, 2016.
- CONANP 2016b. <http://www.gob.mx/conanp/articulos/reserva-de-la-biosfera-caribe-mexicano-89094?idiom=es>. Fecha de consulta: 20 de diciembre, 2016.
- Cuong C.V., Dart, P., Dudley, N. & Hockings, M. 2017. Factors influencing successful implementation of Biosphere Reserves in Vietnam: Challenges, opportunities and lessons learnt. *Environmental Science & Policy* 67, 16–26.
- Cuong, C.V., Dart, P., Dudley, N. & Hockings, M. 2018. Building Stakeholder Awareness and Engagement Strategy to Enhance Biosphere Reserve Performance and Sustainability: The Case of Kien Giang, Vietnam. *Environmental Management* 62, 877–891.
- DFID 1999. Sustainable Livelihoods Guidance Sheets. Sections 1 and 2. Department for International Development. www.livelihoods.org
- Dudley, N., Hockings, M. & Stolton, S. 2004. Options For Guaranteeing the Effective Management of the World's Protected Areas. *Journal of Environmental Policy & Planning* 6, 131–142.
- Durand, L. & Figueroa, F. 2014. Sobrevivir en una selva de proyectos. Relatos sobre la conservación en la comunidad de Nueva Palestina, en la Reserva de la Biosfera Montes Azules, Chiapas. En: Legorreta Díaz, M. C., Márquez Rosano, C. & Trench, T. (Eds.). *Paradojas de las Tierras Protegidas. Democracia y política ambiental en Reservas de Biosfera en Chiapas, México. Colección Alternativas. México.*
- Eastwood, A., Fischer, A. & Byg, A. 2017. The challenges of participatory and systemic environmental management: from aspiration to implementation. *Journal of Environmental Planning and Management*, DOI: 10.1080/09640568.2016.1249787

- Eklund, J., Coad, L., Geldmann, J. & Cabeza, M. 2019. What constitutes a useful measure of protected area effectiveness? A case study of management inputs and protected area impacts in Madagascar. *Conservation Science and Practice* e107.
- Elbakidze, M., Angelstam, P., Sandström, C., Stryamets, N., Crow, S., Axelsson, R., Stryamets, G. & Yamelynets, T. 2013. Biosphere Reserves for conservation and development in Ukraine? Legal recognition and establishment of the Roztochya initiative. *Environmental Conservation* 40, 157–166.
- Elston, D.A., Spezia, L., Baines, D. & Redpath, S.M. 2014. Working with stakeholders to reduce conflict – modelling the impact of varying hen harrier *Circus cyaneus* densities on red grouse *Lagopus lagopus* populations. *Journal of Applied Ecology* 51, 1236–1245.
- Engen, S., Fauchald, P. & Hausner, V. 2019. Stakeholders' perceptions of protected area management following a nationwide community-based conservation reform. *PLoS ONE* 14(4): e0215437.
- García-Frapolli, E. 2006. Conservation from below: Socioecological systems in natural protected areas in the Yucatan Peninsula, Mexico. Tesis de doctorado. Universitat Autònoma de Barcelona.
- Godet, L. & Devictor, V. 2018. What Conservation Does. *Trends in Ecology & Evolution* 33, 720–730.
- Haenn, N. 1999. The Power of Environmental Knowledge: Ethnoecology and Environmental Conflicts in Mexican Conservation. *Human Ecology* 27, 477–491.
- Hodgson, I.D., Redpath, S.M., Fischer, A. & Young, J. 2019. Who knows best? Understanding the use of research-based knowledge in conservation conflicts. *Journal of Environmental Management* 231, 1065–1075.
- IPBES 2019. Media Release: Nature's Dangerous Decline 'Unprecedented'; Species Extinction Rates 'Accelerating'. <https://www.ipbes.net/news/Media-Release-Global-Assessment> Fecha de consulta: 06 de mayo, 2019.
- Kates, R.W. 2011. What kind of a science is sustainability science? *PNAS* 108, 19449–19450.

- Kates, R.W., Clark, W.C., Corell, R., Hall, J.M., Jaeger, C.C., Lowe, I., McCarthy, J.J., Schellnhuber, H.J., Bolin, B., Dickson, N.M., Faucheux, S., Gallopin, G.C., Gruebler, A., Huntley, B., Jäger, J., Jodha, N.S., Kaspersen, R.E., Mabogunje, A., Matson, P., Mooney, H., Moore III, B., O’Riordan, T. & Svedin, U. 2000. Sustainability Science. Research and Assessment Systems for Sustainability Program Discussion Paper 2000-33. Cambridge, MA: Environment and Natural Resources Program, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University.
- Laurance, W.F., Useche, D.C., Rendeiro, J., Kalka, M., Bradshaw, C.J.A., et al. 2012. Averting biodiversity collapse in tropical forest protected areas. *Nature* 489, 290–294.
- Leenhardt, P., Cazalet, B., Salvat, B., Claudet, J., Feral, F. 2013. The rise of large-scale marine protected areas: Conservation or geopolitics? *Ocean & Coastal Management* 85, 112–118.
- Legorreta-Díaz, M.C. & Márquez-Rosano, C. 2015. Democracia, desigualdad y política ambiental en las reservas de la biosfera en México. Un enfoque interdisciplinario. En: Durand, L., Figueroa, F. & Guzmán, M. (Eds.). *La naturaleza en contexto. Hacia una ecología política mexicana*. Colección Alternativas. México.
- León, P. & Montiel, S. 2008. Wild meat use and traditional hunting practices in a rural Mayan community of the Yucatan Peninsula, Mexico. *Human Ecology* 36, 249–257.
- MacKenzie, C., Salerno, J., Hartter, J., Chapman, C.A., Reyna, R., Mwesiye Tumusiime, D. & Drake, M. 2017. Changing perceptions of protected area benefits and problems around Kibale National Park, Uganda. *Journal of Environmental Management* 200, 217–228.
- Martens, P. 2006. Sustainability: science or fiction? *Sustainability: Science, Practice and Policy* 2, 36–41.
- Mas, J. & Correa, J. 2000. Análisis de fragmentación del paisaje en el área protegida Los Petenes. *Investigaciones Geográficas* 42–52.

- Masterson, V.A., Spierenburg, M., Tengö, M., 2019. The trade-offs of win-win conservation rhetoric: exploring place meanings in community conservation on the Wild Coast, South Africa. *Sustainability Science* 14, 639–654.
- McShane, T.O., Hirsch, P.D., Trung, T.C., Songorwa, A.N., Kinzig, A., Monteferri, B., Mutekanga, D., Van Thang, H., Dammert, J.L., Pulgar-Vidal, M., Welch-Devine, M., Brosius, J.P., Coppolillo, P. & O'Connor, S. 2011. Hard choices: Making trade-offs between biodiversity conservation and human well-being. *Biological Conservation* 144, 966–972.
- Méndez-Contreras, J., Dickinson, F. & Castillo-Burguete, T. 2008. Community member viewpoints in the Ría Celestún Biosphere Reserve, Yucatán, México: Suggestions for improving the community/natural protected area relationship. *Human Ecology* 36, 111–123.
- Millennium Ecosystem Assessment 2005. *Ecosystems and human well-being: synthesis*. Island Press, Washington, DC.
- Miller, T.R., Minter, B.A. & Malan, L.C. 2011. The new conservation debate: The view from practical ethics. *Biological Conservation* 144, 948–957.
- Montiel, S., Estrada, A. & León, P. 2006. Bat assemblages in a naturally fragmented ecosystem in the Yucatan Peninsula, México: species richness, diversity and spatio-temporal dynamics. *Journal of Tropical Ecology* 22, 267–276.
- Nautiyal, S. 2011. Can conservation and development interventions in the Indian Central Himalaya ensure environmental sustainability? A socioecological evaluation. *Sustainability Science* 6, 151–167.
- ONU 2015. *Transformar nuestro mundo: la Agenda 2030 para el Desarrollo Sostenible*. <http://www.un.org/es/comun/docs/?symbol=A/RES/70/1>. Fecha de consulta: 17 de febrero, 2017.
- OECD 2012. *OECD Environmental Outlook to 2050*, OECD Publishing.

- Pat-Fernández, J.M. & Hernández-Bahena, P. 2004. Memoria del Taller de Diagnóstico de los Sistemas de Producción en el área aledaña a la Reserva de la Biósfera de Los Petenes (RBLP), Campeche, México. pp. 55.
- Pat-Fernández, J.M., Hernández-Bahena, P., Sánchez-Pérez, L.C. & Villalobos-Zapata, G.J. 2006. Memoria del Taller Participativo. El contexto demográfico, económico y social en comunidades aledañas a la Reserva de la Biósfera de Los Petenes (RBLP), Hecelchakán, Campeche, México. El Colegio de la Frontera Sur. pp. 90.
- Pimbert, M.P. & Pretty, J.N. 1995. Parks, People and Professionals: Putting 'Participation' into Protected Area Management. Discussion Paper No 57, UNRISD, Geneva.
- Porter-Bolland, Drew, L.A.P. & Vergara-Tenorio, C. 2006. Analysis of a natural resources management system in the Calakmul Biosphere Reserve. *Landscape and Urban Planning* 74, 223–241.
- Radachowsky, J., Ramos, V.H., McNab, R., Baur, E.H. & Kazakov, N. 2012. Forest concessions in the Maya Biosphere Reserve, Guatemala: A decade later. *Forest Ecology and Management* 268, 18–28.
- Reed, M.G. 2018. The contributions of UNESCO Man and Biosphere Programme and biosphere reserves to the practice of sustainability science. *Sustainability Science* DOI: 10.1007/s11625-018-0603-0
- Roe, D. 2008. The origins and evolution of the conservation poverty debate: a review of key literature, events and policy processes. *Fauna & Flora International, Oryx* 42, 491–503.
- Salafsky, N. 2011. Integrating development with conservation: A means to a conservation end, or a mean end to conservation? *Biological Conservation* 144, 973–978.
- Sarkar, S. & Montoya, M. 2011. Beyond parks and reserves: The ethics and politics of conservation with a case study from Perú. *Biological Conservation* 144, 979–988.
- Sarukhán, J., Urquiza-Haas, T., Koleff, P., Carabias, J., Dirzo, R., Ezcurra, E., Cerdeira-Estrada, S. & Soberón, J. 2015. Strategic actions to value, conserve, and restore the natural capital of megadiversity countries: the case of Mexico. *BioScience* 65, 164–173.

- Scoones, I. 1998. Sustainable Rural Livelihoods: A Framework for Analysis. IDS Working Paper 72.
- Secretaría de Medio Ambiente y Recursos Naturales 2014. Programa Nacional de Áreas Naturales Protegidas 2014-2018. pp. 152. México: SEMARNAT-CONANP.
- Smardon, R.C. & Faust, B.B. 2006. Introduction: international policy in the biosphere reserves of Mexico's Yucatan peninsula. *Landscape and Urban Planning* 74, 160–192.
- Stepanova, O., Polk, M. & Saldert, H. 2019. Understanding mechanisms of conflict resolution beyond collaboration: an interdisciplinary typology of knowledge types and their integration in practice. *Sustainability Science* DOI: 10.1007/s11625-019-00690-z
- Sutherland, W.J., Adams, W.M., Aronson, R.B., Aveling, R., Blackburn, M., Broad, S., Ceballos, G., Côté, I.M., Cowling, R.M., Da Fonseca, G.A.B., Dinerstein, E., Ferraro, P.J., Fleishman, E., Gascon, C., Hunter Jr., M., Hutton, J., Kareiva, P., Kuria, A., Macdonald, D.W., Mackinnon, K., Madgwick, F.J., Mascia, M.B., Mcneely, J., Milner-Gulland, E.J., Moon, S., Morley, C.G., Nelson, S., Osborn, D., Pai, M., Parsons, E.C.M., Peck, L.S., Possingham, H., Prior, S.V., Pullin, A.S., Rands, M.R.W., Ranganathan, J., Redford, K.H., Rodriguez, J.P., Seymour, F., Sobel, J., Sodhi, N.S., Stott A., Vance-Borland, K., & Watkinson, A.R. 2009. One hundred questions of importance to the conservation of global biological diversity. *Conservation Biology* 23, 557–567.
- Tsing, A.L. 2015. *The Mushroom at the End of the World: on the possibility of life in capitalist ruins*. Princeton University Press.
- UN 1992. Convention on biological diversity. United Nations Environment Programme, Nairobi.
- UNESCO 2011. Biosphere Reserves – Learning Sites for Sustainable Development. <http://www.unesco.org/new/es/natural-sciences/environment/ecological-sciences/biosphere-reserves/> Fecha de consulta: 21 de abril, 2016.

- UNESCO 2014. Ancient Maya City and Protected Tropical Forests of Calakmul, Campeche. <https://whc.unesco.org/en/list/1061/documents> Fecha de consulta: 19 de abril, 2016.
- UNESCO 2016. Lima action plan for UNESCO's Man and the Biosphere Program and its World Network of Biosphere Reserves (2016–2025). [http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/pdf/Lima Action Plan en final.pdf](http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/pdf/Lima_Action_Plan_en_final.pdf). Fecha de consulta: 28 agosto 2019
- Visconti, P., Butchart, S.H.M., Brooks, T.M., Langhammer, P.F., Marnewick, D., Vergara, S., Yanosky, A. & Watson, J.E.M. 2019. Protected area targets post-2020. Outcome-based targets are needed to achieve biodiversity goals. *Science* 364, 239–241.
- Waylen, K.A., Fischer, A., McGowan, P.J.K. & Milner-Gulland, E.J. 2013. Deconstructing Community for Conservation: Why Simple Assumptions are Not Sufficient. *Human Ecology* 41, 575–585.
- West, P., Igoe, J. & Brockington, D. 2006. Parks and Peoples: The Social Impact of Protected Areas. *Annual Review of Anthropology* 35, 251–77.
- Wright, J.H., Hill, N.A.O., Roe, D., Rowcliffe, J.M., Kümpel, N.F., Day, M., Booker, F. & Milner-Gulland, E.J. 2016. Reframing the concept of alternative livelihoods. *Conservation Biology* 30, 7–13.
- Yañez-Arancibia, A. 1996. Caracterización Ecológica de la Región de Los Petenes. Informe Técnico. EPOMEX-UAC, Campeche.
- Young, J.C., Jordan, A., Searle, K.R., Butler, A., Chapman, D.S., Simmons, P. & Watt, A.D. 2013. Does stakeholder involvement really benefit biodiversity conservation? *Biological Conservation* 158, 359–370.