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Examining the shifting patterns of poaching from a long-term law enforcement intervention in Sumatra

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ABSTRACT

Current levels of illegal wildlife trade for many in-demand species are unsustainable and place them at a heightened risk of extinction. While several Asian protected areas standout for their remarkable successes in tackling poaching, the threat continues nonetheless. We analyse a decade of law enforcement data from a Sumatran protected area to investigate tiger and prey poaching trends, the arrests and subsequent prosecution of those involved. Some 3882 snare traps were destroyed, but a recent spike in tiger poaching revealed that twice the number of snares were annually encountered in 2013 and 2014 than the eight preceding years. We detected a change in the techniques employed for poaching tigers from 2011 onwards, with more frequent encounters of snare trap clusters that contained six or more tiger traps set in a single location. Comparing monthly patterns of poaching within years revealed an increase in deer, but not tiger, poaching during the month of Ramadan. This result confirmed long-held views by the ranger teams that local demand for meat increases in the build up to Idul Fitri, a main Islamic holiday. Finally, from 24 law enforcement operations conducted, 40 tiger poachers/traders were arrested with >90% being prosecuted. However, the fines and prison sentences issued were much lower than the maximum available, and the highest sentence was for firearms possession and not illegal activities towards wildlife. Our site-based study demonstrates what can be achieved, but also identifies areas for strengthening the sub-national and national law enforcement response to an escalating tiger poaching trend.

1. Introduction

Overexploitation by humans threatens about one-third of the endangered species of vertebrates (Rosser & Mainka, 2002), with one of the most serious threats being poaching, which relates to the illegal sale, harvest, transport, possession, purchase and use of wildlife and their parts (Lawson and Vines, 2014). After drugs, weapons and counterfeiting, wildlife and their products represent the greatest illegal traffic. Currently the world is dealing with an unprecedented rise in wildlife poaching that could overturn decades of conservation gains (Dutton et al., 2013). For instance rhino poaching, feeding the unsustainable demand for rhino horn in China and Vietnam, has sharply risen over the past few years, with 1175 rhinos poached in 2015 in South Africa alone (TRAFFIC, 2016). Likewise, the recent extirpation of tigers from flagship protected areas or entire countries has been driven by the high demand created from a rising Asian middle class with a greater disposable income and new found taste for luxury goods that includes wildlife products (Bennett, 2011).

To prevent threatened wildlife from entering into the market, robust site-based tiger protection that involves ranger patrols to dismantle snare traps and deter poachers is essential. Likewise, outside of the forest local informants and law enforcement operations to dismantle trade networks is essential. A recent tiger study from Kerinci Seblat National Park, a global priority Tiger Conservation Landscape in Sumatra, investigated the effectiveness of forest ranger patrols in mitigating the poaching of tiger and their prey (Linkie et al., 2015). While this study

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did not find an overall decline in poaching, it did identify localised declines in response to sustained law enforcement intervention at key patrol sites. The study also raised several previously unaddressed research questions that warrant investigation for potentially enhancing conservation strategies. These include, for example, i) how methods employed by tiger and/or poachers have changed over time and whether this is in response to law enforcement interventions; and, ii) how the number of arrests and the subsequent prosecutions rates have changed and, if so, the reasons for this?

Next, a question arises over which timescale to analyse poaching trends is most revealing. For example, monthly statistics might provide richer information than coarser annual figures that are commonly used. In this regard, insights accumulated from our long-term experiences (10–20 years) of working in Sumatra include ranger team comments on a change in deer poaching intensity during the Islamic holy month Ramadan, when venison is in high demand for the forthcoming Idul Fitri celebratory feast. This is a time when food prices, particularly meat from reared animals, increases by 10–30% in local markets. So, the motivations for hunting may be driven by consumer preference, such as cost or taste, and therefore require specific seasonal responses (Luskin et al., 2014).

The purpose of this study is to assess whether the nature of tiger and prey poaching is changing. We select Kerinci Seblat because it is, we argue, representative of other forest tiger landscapes and protected areas in Southeast Asia and has a long-term law enforcement dataset. Thus, from 2005 to 2014, we aim to assess: i) annual poaching patterns of tigers and their ungulate prey base; ii) monthly poaching patterns within the study years; and, iii) fines and prosecutions for trading tiger body parts. The first aim primarily sets out to determine whether poaching intensity and the methods employed by poachers towards targeting either tiger or its prey species has changed over time. The second aim sets out to test whether there is change in poaching intensity for either tiger or deer during specific times, such as Ramadan. The third aim is intended to answer whether the number of arrests and prosecutions has changed over time. Finally, we discuss the reasons for these changes and how the law enforcement response should be modified to tackle an evolving threat.

2. Materials and methods

2.1. Study area

The 13,800 km^2 Kerinci Seblat National Park spans the Indonesian provinces of West Sumatra, Jambi, Bengkulu and South Sumatra. Its forests and wildlife comprise a single management unit that is under the Ministry of Environment and Forestry. The National Park has an elevation that ranges from 175 m asl to 3805 m, but its forest ranger teams primarily conduct patrols from 175 m asl (lowland forest) to 1500 m (montane forest). The park has an elongated shape that is 375 km long and typically <35 km wide, with an enclave in the central section which is not part of the protected area. In combination, these features create a long boundary and make the forest highly accessible to poachers. Kerinci Seblat National Park is a UNESCO World Heritage Site and a Level 1 Tiger Conservation Landscape, in recognition of its abundant and widespread tiger population (Dinerstein et al., 2007; Linkie et al., 2006; Wibisono et al., 2011).

In the year 2000, two Tiger Protection and Conservation Units (referred to as 'patrol teams' hereafter) were established by the National Park management authority and the international NGO Fauna & Flora International (FFI). These patrol teams steadily increased until 2005–2006 when five units were established, all of which continue to the present day. A sixth team was active in 2006–2007 and then 2013 onwards. A team typically consists of four rangers, but may on occasion be five rangers. To select these rangers, there is an initial 1–3 month training phase that is used to evaluate candidates, with the best performing ones recruited full-time to the TPCU programme. This is followed by formal training that includes SMART-based patrolling, species sign recognition, sourcing information on threat and wildlife crime and navigation (map reading and GPS use). However, much of the training is on-the-job to enable learning from experienced peers. The TPCU leaders have between six and eight years' experience and within teams the amount of experience ranges from newly graduated rangers to those who have been working since the beginning of the programme in 2000 (*i.e.* >15 years'). Annual evaluations on individual team and ranger performance are conducted, which may result in rangers being moved between teams to ensure each has similarly high levels of field experience and high performing staff.

We selected 2005 to 2014 as the focal period for this study because it coincides with when most of the patrol teams were active. The primary aim of the patrol teams is to secure the population of wild tigers inside the National Park and its adjacent forests through reducing the threats from poaching, domestic trade of tiger and prey, and conflict with forest-edge communities.

2.2. Field data and analysis

Two main types of data are used in this study: i) patrol team data on the location and number of active snare traps set for tigers and their prey (typically sambar deer (*Rusa unicolor*), muntjac (*Muntiacus* sp) and sometimes serow (*Capricornis sumatrensis*)), for which data were aggregated by month and year; and, ii) records of law enforcement operations that set out to arrest tiger poachers and traders and which included information on the outcome of these arrests.

Field data were compiled using information recorded in patrol team logbooks and data sheets collected by five teams covering eight districts. On patrol, a team of four rangers would record its route, using a GPS unit and compass, on a 1:50,000 paper topographic map. Key signs of encounters were also recorded in logbooks and these included indications of snaring or other forms of poaching (whether for mammals or birds) and the presence of threats to habitats, such as illegal logging. Two types of snare trap were recognized and these were primarily differentiated by the construction of the snare anchor, its strength and the material used. A metal cable indicated a snare trap set for a tiger, whereas a nylon rope would conventionally be set for ungulate prey.

From 2005 to 2014, data from patrol team logbooks were used to calculate the number of patrols conducted during each year. Patrol effort was measured as the number of patrol kilometers walked, team days expended and number of patrol trips. The inter-dependency of these three metrics was measured using a Spearman's rho test to identify a single metric for patrol effort to be used in the subsequent analyses. For each study year, the absolute abundance of snare traps set for tigers and for their prey was determined, from which the catch-per-unit effort of the ranger teams was calculated by dividing by patrol effort. To determine whether and how the number of patrols detecting signs of tigers and prey poaching changed over time, a Spearman's rho test was performed. The temporal pattern of tiger snare trap clusters was measured by calculating the number of snare traps set within a 1 km radius for each year from 2005 to 2014. Cluster categories were 1–2 traps, 3–5 traps and >6 traps. These category sizes were determined through consultations with the patrol teams on the snaring patterns that they had observed over the study period. In the earlier study years, the teams consistently noted that one or two traps were most frequently encountered, but more recently larger clusters of snares were being encountered. We sought to test this using a Fisher's exact test on whether there were non-random associations between the occurrences of these cluster types across years.

To investigate changes in poaching intensity across the months for each of the years, we separately calculated year-wise circular means and associated 95% confidence intervals (CIs) for the number of tiger and prey snare traps removed by anti-poaching patrols. A Rayleigh's test was performed using the 'circular' package in R (Agostinelli & Lund, 2013) to test whether there was significant clustering in the