Chapter

A Step Change in Wild Boar Management in Tuscany Region, Central Italy

Paolo Banti, Vito Mazzarone, Luca Mattioli, Marco Ferretti, Andrea Lenuzza, Rocco Lopresti, Marco Zaccaroni and Massimo Taddei

Abstract

In this chapter, reducing the high-density populations of wild boars in an Italian's Tuscany region is addressed as a measure of controlling crop damage and road accidents. The issue is usually tackled from a technical and rarely sociological point of view, making the proposed and implemented solutions less effective. The results presented in these chapter highlight the importance of awareness of the social context when the technical choices are applied. The management of ungulates creates economic interests that oppose changes that shift the economic balance, even when the actions taken are for the benefit of the entire community'. In the previous decades, the wild boar populations have increased considerably in Italy in the Tuscany region. As a consequence of this phenomenon, damage to crops and road accidents has increased. In 2016, the Tuscany region enacted a law to change the management of ungulates by promoting individualism in unsustainable harvest rate areas, allowing shooting wild boar with stalking and selling the meat and maintaining a corporate approach in sustainable harvest rate areas. In three years of enforcing the law, damage to crops and road accidents have decreased significantly and meet supply chain has started. On the other hand, a strong reaction against this Law by wild boar drive hunters emerged. The region is, consequently, faced with an emblematic case where political intervention in future is inevitable in order to mediate between long-term results and short-term consensus.

Keywords: wildlife management, drive hunt, stalking, crop damages, vehicle accidents

1. Introduction

Wild boar (*Sus scrofa*) is among the widest-ranging mammals on the Earth. In Europe, from the 1960s to date, the population has grown dramatically, and its distribution range has expanded [1]. The species has a remarkable ability to adapt to different habitats; this has fostered its spread throughout the European continent, where only three limiting conditions for the habitat requirements have been described: vegetation providing shelter from predators, water for drinking and bathing, and the absence of regular snowfall [2, 3]. The increase in population size

has exacerbated crop damages and social conflicts [4–7]. The amount paid by hunters and governments for crop damages caused by wild boar in Europe amounts to millions of Euros [8, 9], and this has increased the effort for preventative methods [10], hunting included [11]. Moreover, the increase of wild boar-vehicle accidents followed by a rise in costs, and people injured should not be underestimated [12]. Some costs can be easily estimated, but others cannot. For example, the cost over the years for seriously injured people's health care is difficult to estimate and usually not considered. European wild ungulates management cope with these challenges under different approaches related to national regulations.

2. Policy and legal governing wildlife and problem animals

In Italy, the management and conservation of wild fauna are mainly organised by public institutions and, to a lesser extent, by private institutions. The current legislation (Law 157/92), transposed the directives of the European Union 79/409/EEC, 85/411/EEC, 91/244/EEC, but in 1992 problems related to the management of ungulates were not particularly felt because the strong demographic expansion took place in the following years. The legislation was inadequate, thus was integrated in 2005 with the national law "248/2005, article 11-quaterdecies, paragraph 5", in which the hunting periods and hours for ungulates were extended. However, the expansion of the ungulate species present in Italy continued. If this was evaluated positively for roe deer and red deer, the same cannot be said for wild boar. The demographic growth of wild boar, favoured by the abandonment of the countryside, by the reduced presence of predators by the illegal releases of subjects coming from other European countries and by foraging, has become the main problem related to agricultural crops' damage and road accidents. The Italian regions organised into provincial or sub-provincial territorial management areas (ATC) have not been able to address the problem effectively with the current legislation. In Tuscany, where traditional wild boar hunting is a cultural heritage, this problem is more evident because ungulate management aimed for decades to increase the abundance of this species for hunting purposes. In this framework, we present the possibility of shifting to a more elastic management model, adapting the hunting periods and hunting techniques to local conflicts with human activities. In 2016 a Regional law (10/2016) brought in Tuscany significant changes in the approach of the ungulate management. This law aimed to reduce, within three years, the agricultural damages caused by wild ungulates, vehicle accidents and strengthen the bush meat supply chain.

Tuscany Region spans an area of 2,298,500 hectares, from the sea to the Appenine mountains, woodland cover the 47% and agricultural areas characterised by vineyard olive grove and cerals cover the 43%. Florence is the biggest city of the region with 800.000 people, the other city Pisa, Arezzo, Siena, Livorno, Grosseto, Lucca, Prato and Massa-Carrara, Pistoia are smaller and with the other urban areas cover the 10% of the territory (**Figure 1**). As in the rest of the country, there is no reliable estimate of the wild boar population, but it is possible to have a rough idea from last year's hunting bag. Wild boars culled from 2015 to 2019 ranged from 70,384 to 96,042 per year (**Table 1**). These data suggest that Tuscany can be considered among the regions with the highest wild boar density in Europe. Ungulate damages continuously increased from 2000 to 2017, and in the last years, the amounts paid to farmers exceeded 2,000,000€ per year (**Table 2**), mainly caused by wild boar to vineyards and cereals. Simultaneously, the economic efforts to prevent crop damages increased, reaching more than 500,000€ per year. A mean of 690 road accidents involving ungulates was recorded every year in Tuscany (2012–2015 average of

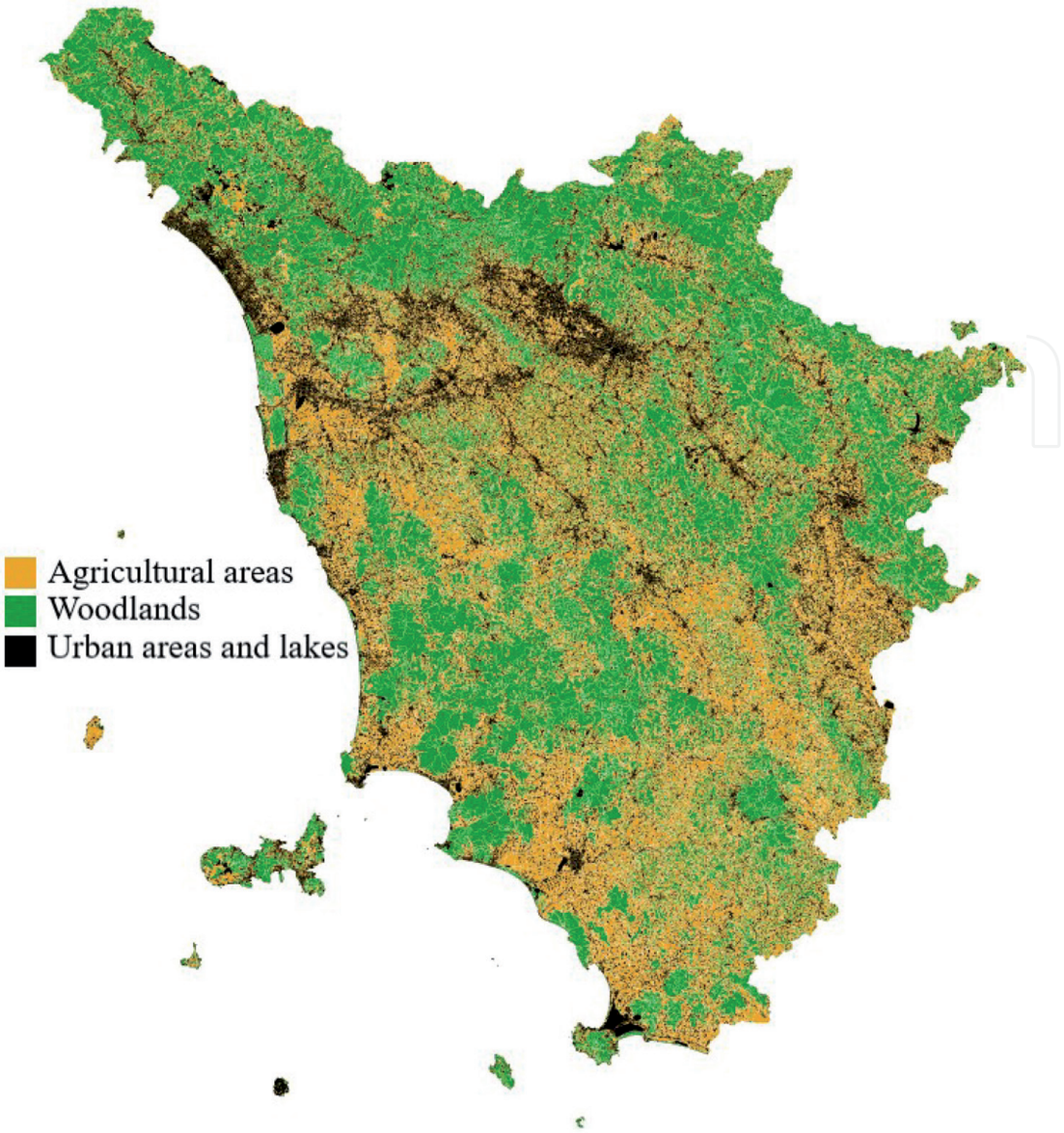

Figure 1.
Study area.

Wild boar hunting techniques	2015	2016	2017	2018	2019
Drive hunt in SHRA	67701	74815	62109	56135	55061
Stalking in UHRA	629	4581	8445	6226	6670
Police officers	10029	9927	13569	10775	5959
Total	79330	96042	88817	76829	70384

Table 1.
Wild boars shot from 2015 to 2019.

claims reported), with consequent material damages, injuries and, in some cases, deaths. In this scenario, the police officers' ungulates culling shifted in recent years from an extraordinary activity, to ordinary and generalised practice, with more than 40,000 culling events per year. The number of ungulates shot or trapped by police officers represents 10% of the hunting bag. The constant decrease of hunters in previous years has resulted in a reduction of the hunting pressure, thus the failure to set reliable goals for the harvest of ungulate populations by using traditional

Species/Years	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Roe deer	185.848 €	165.943 €	340.853 €	290.174 €	301.874 €	452.947 €	519.391 €	837.573 €	157.362 €	162.017 €
Red deer	76.506 €	59.871 €	263.291 €	249.185 €	199.296 €	42.156 €	40.435 €	50.951 €	47.799 €	16.986 €
Wild boar	1.049.262 €	1.115.477 €	1.188.767 €	1.032.953 €	1.347.308 €	2.072.198 €	1.792.023 €	2.181.951 €	841.416 €	884.571 €
Fallow deer	46.083 €	51.454 €	59.166 €	82.488 €	73.468 €	67.823 €	80.834 €	122.290 €	20.731 €	20.381 €
Muflon	10 €	40 €	0 €	0 €	12 €	0 €	0 €	0 €	0 €	0 €
Underterminated ungulates	1.085 €	9.164 €	13.435 €	879 €	7.544 €	0 €	0 €	0 €	0 €	12.654 €
Damage caused by ungulates	1.358.784 €	1.401.949 €	1.865.512 €	1.655.679 €	1.929.503 €	2.635.124 €	2.432.683 €	3.192.765 €	1.067.308 €	1.096.609 €
Damage caused by wildlife	1.620.604 €	1.692.474 €	2.112.086 €	2.017.955 €	2.286.166 €	2.929.130 €	2.864.055 €	3.390.665 €	1.114.569 €	1.177.742 €
% Damage wild boar/total	65	66	56	51	60	60	63	64	75	75
% Damage ungulates/total	84	83	88	82	84	83	85	94	96	93

Table 2.
Crop damages divided per species.

techniques. This has prompted two important questions: What should be done when the traditional ungulate management system has proved inadequate to solve the problems described above? What solutions should be included in a framework where the wild boar population is increasing in tandem with growing damage to agriculture and vehicle accidents while economic and human resources are decreasing?

The law enacted in 2016 has attempted to address these challenges through the following four interventions:

1. Ungulate management differentiation between sustainable and unsustainable harvest rate areas.

2. Adopt ordinary hunting activity as an alternative to systematic culling conducted by police officers.

3. Planning ungulate population management in districts.

4. Support the creation of a meat supply chain for wild ungulates.

These interventions are briefly discussed in this chapter.

2.1 Ungulate management differentiation between sustainable and unsustainable harvest rate areas

Sustainable harvest rate areas (SHRA), mainly characterised by woody and bushy areas, were organised with a conservative ungulate population approach (**Figure 2**). On the other hand, unsustainable harvest rate areas (UHRA) aimed to reduce the population substantially. The territory was classified as SHRA or UHRA for each ungulate species based on agricultural damages recorded and potential impact on crops. In Tuscany, almost 50% of the territory is currently UHRA for wild boar and 24% for roe deer (*Capreolus capreolus*). Red deer (Cervus elaphus) has SHRA across the Apennine mountain areas. Fallow deer (*Damadama*) and mouflon (*Ovis aries*) are present in small and localised populations; thus, the management of these species is easier.

In UHRA, the hunting period has been extended for stalking. The harvest rate was set to remove 100% of the abundance estimated during the census, plus the expected increase. The Law sought to reduce ungulate populations, increasing hunting pressure in agricultural and around the urbanised areas. Little or nothing changed in the ungulate management of SHRA, where the target is the conservation of the species.

2.2 Adopt ordinary hunting activity as an alternative to systematic culling conducted by police officers

One of the most important innovations of the Law 10/2016 was the extension to the whole year of the hunting season for wild boar stalking since it had no impact on non-targeted species. It represents the only hunting method on ungulates that can be allowed even in critical periods for crops and other species' biological cycles. The possibility to use police officers in areas and times of hunting ban was, however, provided. On the other hand, involving police officers in these activities means expensive and complicated procedures (request of the farmer, application of proactive measures, single authorisation act, and coordination of the police officers). For these reasons, the Law aimed to shift from an expensive and extraordinary approach to a profitable and ordinary activity.

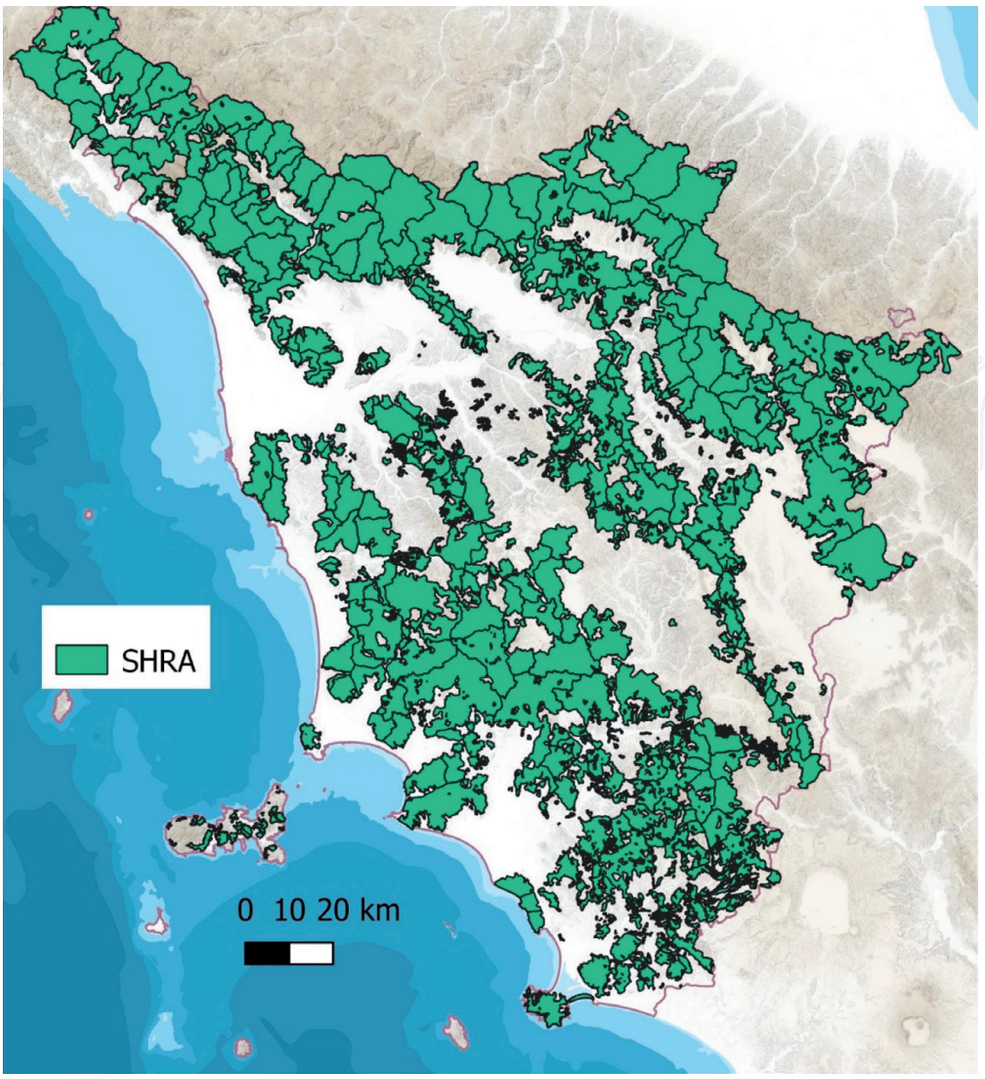

Figure 2.
Wild boar sustainable harvest rate areas.

2.3 Planning ungulate's population management in districts

The Law introduced the concept of district management, big enough to include private and public hunting sub-districts and protected areas. The aim was to overcome the past fragmentation of competencies, standardising census techniques, harvest rate, and protected areas management. Thus, Tuscany has been divided into 800 Ungulate sub-districts coded through an App (Toscaccia) where wildlife technicians can add the census data, hunting bag, and a free access cartographic portal, Geoscope (http://www502.regione.toscana.it/geoscopio/cacciapesca.html).

2.4 Support the creation of a supply chain for wild ungulates meat

Ungulates meat supply chain represents a strategic topic in wildlife management. In UHRA, permits were fixed cheap to increase the hunting pressure, given the possibility to sell the hunted meat, promoting an economical chain among hunters, farmers and meat retailers (game handling establishments, butchers, meat chains and dealers) and consumers. The aim was to transform the "ungulate problem" through rational hunting exploitation into managing a renewable economic resource.

Here we reported three years of this management strategy focusing on wild boar because it was the main problem from an economic and sociological perspective.

In Tuscany, the wild boar drive hunt is the traditional hunting method. Dozens of people organised in teams manage the territory, in particular the SHRA. A few years ago, drive hunt was the only method allowed for wild boar, and teams managed the entire population; thus, the feeling of ownership of wild boars living in those territories was solid. This activity is more than a hunting technique; it represents a recreational activity that involves hundreds of people. In the rural context, the village festival organised by wild boar hunters is one of the most important social events. On the other hand, the wild boar was the main cause of road accidents and crop damage with a growing trend. Thus, it is comprehensible (but not acceptable) that a new management strategy aimed to eradicate the wild boar population in the UHRA caused a social conflict.

The eradicative approach of wild boar populations in UHRA with the stalking method throughout the year is the most novel aspect introduced in 2016 because it increased the hunting pressure and the competition among hunters. UHRA were organised to favour individualism; no limits for the number of people in the districts, no necessity to be accepted in the UHRA from other hunters, no assignment of the number of animals to shot, and no assignment of a hunting area in the UHRA. These rules favour individualism and strongly reduce social control over the hunters. Stalking was in addition to the drive hunt, but the last one is allowed only in SHRA for three months in winter. Although stalking was also allowed in SHRA, it has never been applied due to conflicts with drive hunters that traditionally manage the SHRA.

From 2016 to 2019, almost 26,000 wild boars were culled by stalking in UHRA. In the same period, 248,120 wild boars were culled in SHRA with drive hunt, which means that the impact of stalking on wild boar population is much lower than drive hunt, but stalking was applied on agricultural areas, where human conflicts emerged. Stalking of wild boar showed a peak of culling from April to September (**Figure 3**). However, the hunting bag structure did not represent the population's demographic structure, showing a prevalence of adult males culled (**Figure 4**). Cautiousness is needed to analyse these data because some hunters avoid shooting females when pregnant or with piglets.

Stalking had a more significant impact in spring and summer when other hunting methods were not allowed, mainly when crop damages were more significant. Population control by police officers, usually exploited with drive hunters, was previously carried out in the autumn and winter seasons. However, from 2016 to

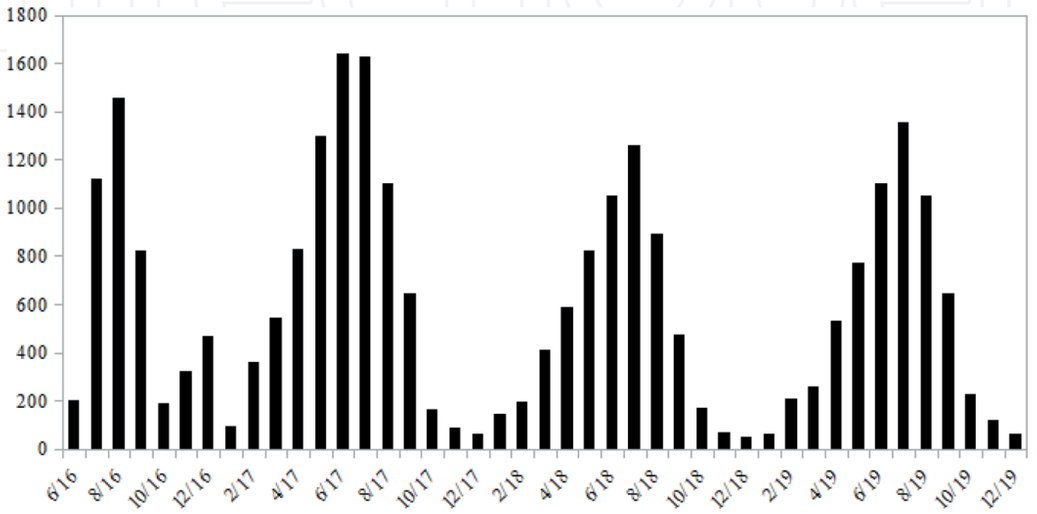

Figure 3.
Wild boars shot by stalking monthly from June 2016 to December 2019.

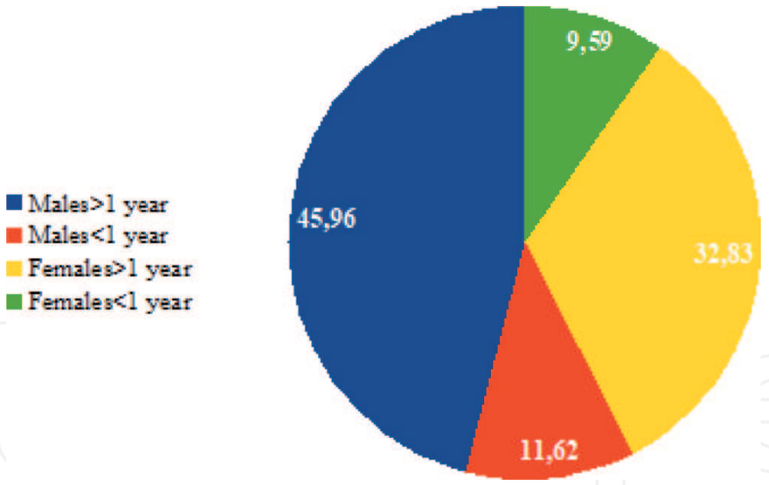

Figure 4.
Demographic structure of wild boars shot from June 2016 to December 2019.

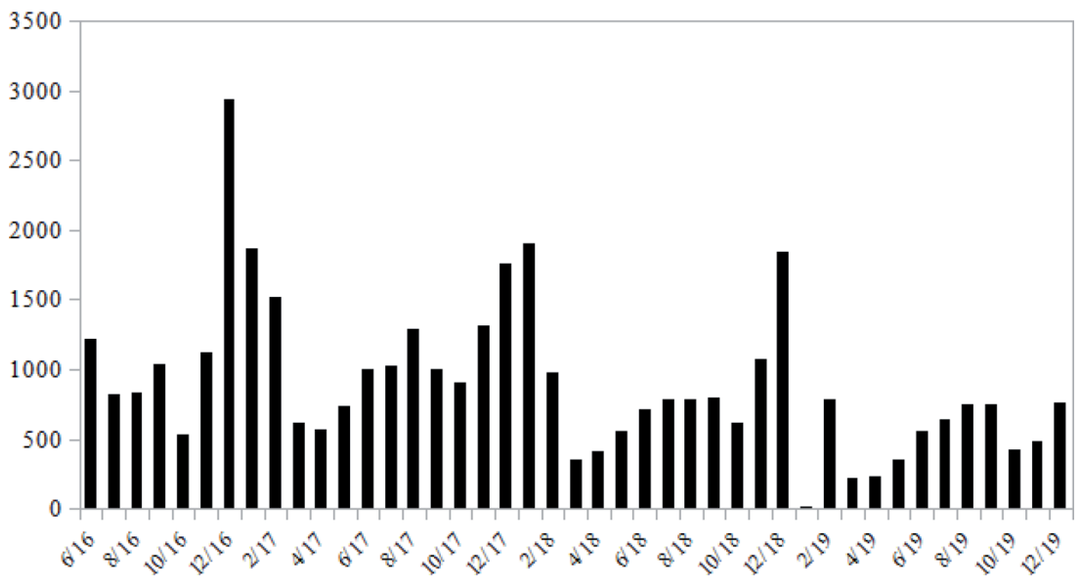

Figure 5.
Wild boars shot under police control monthly from June 2016 to December 2019.

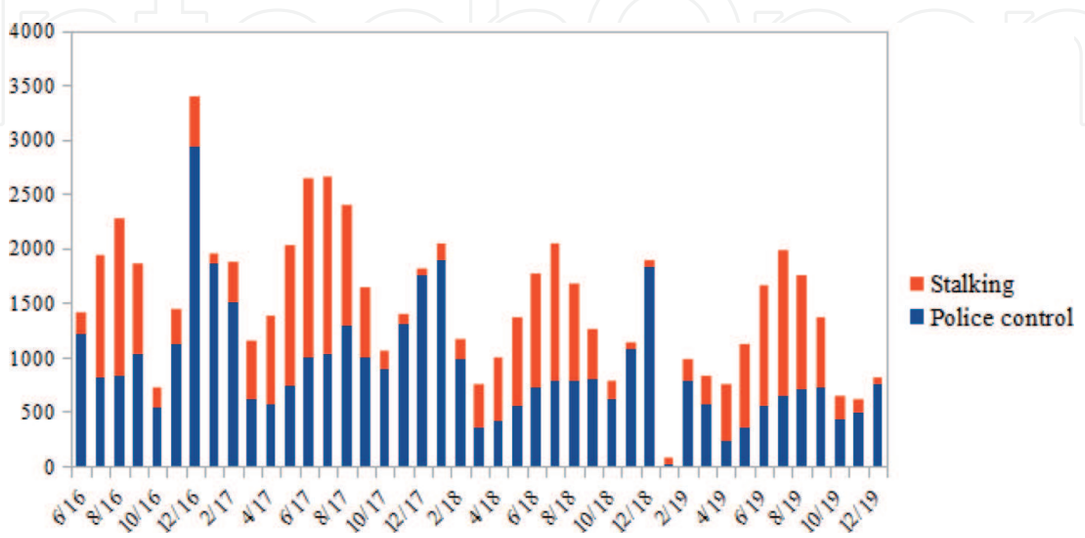

Figure 6.
Wild boars shot by stalking and under police control from June 2016–December 2019.

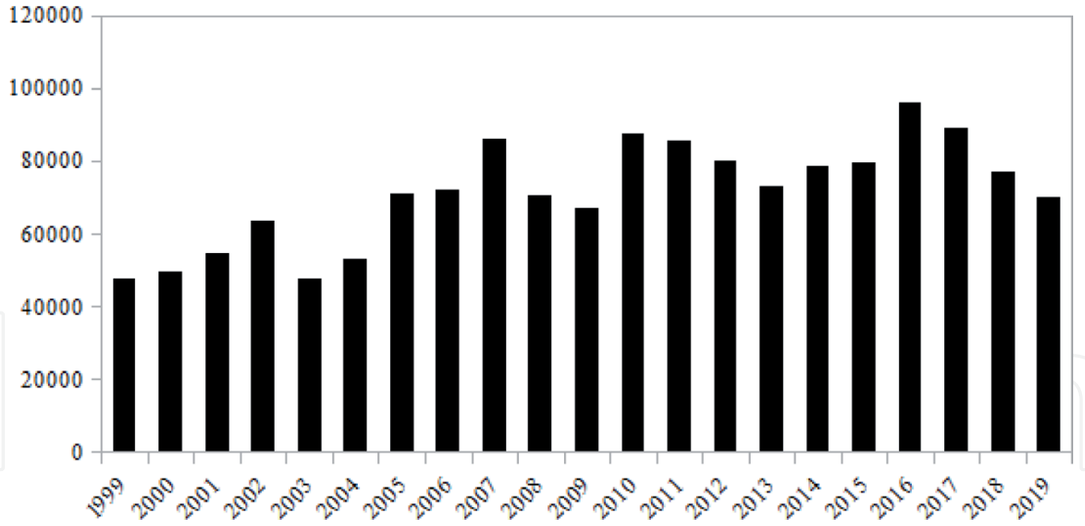

Figure 7.
Wild boars shot with drive hunt, 1999–2019.

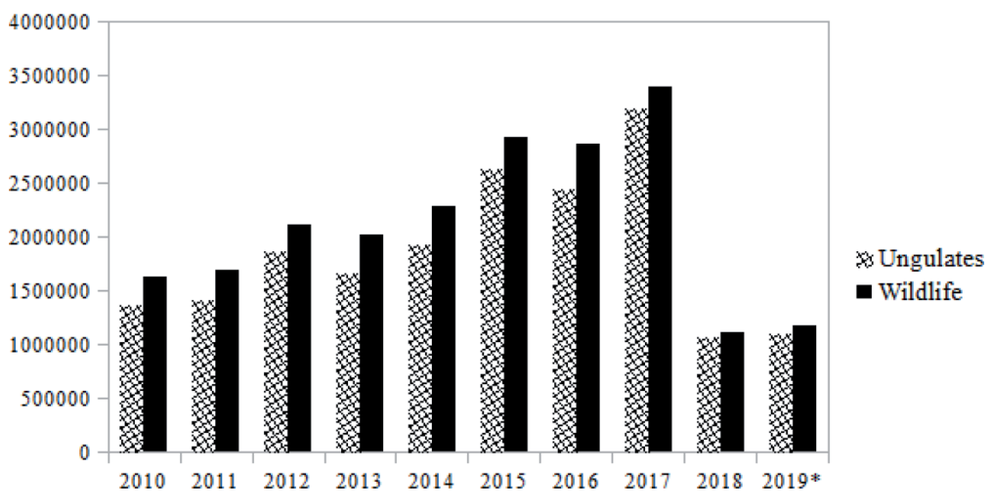

Figure 8.
Wildlife damages to agriculture in €.

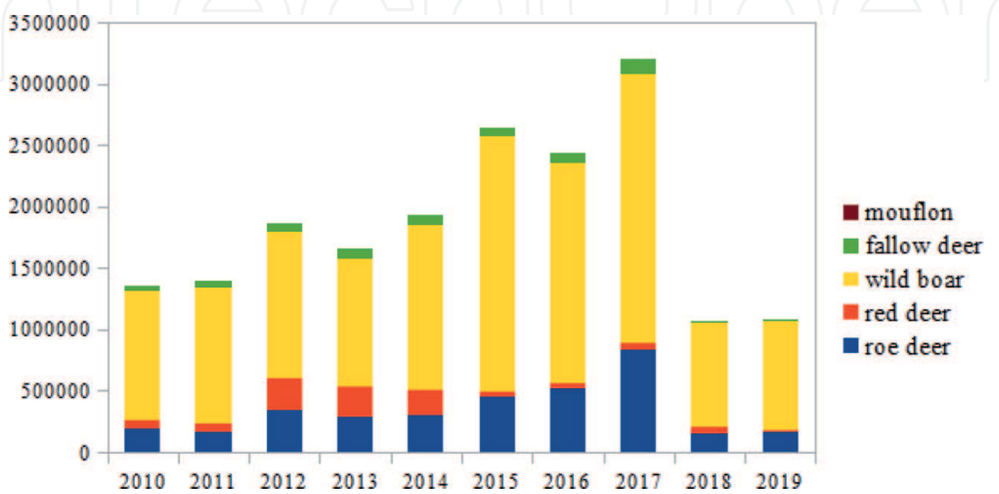

Figure 9.
Damages to agriculture caused by ungulates and wildlife in Tuscany in €.

2019, they became better distributed during the year (**Figure 5**); this means that a significant change of strategy has affected the overall approach to hunting and control, which resulted in complementary during the year (**Figure 6**).

Despite attempts to hinder the start of stalking, many hunters approached this method with great interest. In three years, almost 15,000 boar stalkers were trained in Tuscany. Thanks to the hunting pressure in UHRA, a virtuous mechanism started with an indirect effect on the management of SHRA, where hunting pressure of drive hunters increased, particularly at the border of UHRA. In fact, it was indicated that 2016 had the most significant number of culls in the past twenty years (**Figure 7**). Then, the hunting bags recorded a generalised decrease of culled boars until 2019.

Ungulates caused most of the crop damages (**Figure 8**), and among ungulates, wild boar was the leading problem animal (**Figure 9**). From 2016 to 2019, crop damages and vehicle accidents decreased significantly (**Figures 7** and **10**). The meat supply chain started slowly for the reasons described below because the market prefers animals shot through stalking. In three years, seventeen structures were built where hunters could deliver wild ungulates; fourteen managed by hunting districts, one by a Park Authority and two by the private sector. The available amount of wild boars culled for the supply chain is still below 10% of the wild boar shotdue to logistical/structural problems and killing methods because hunted ungulates are not always suitable for the market (**Figure 11**).

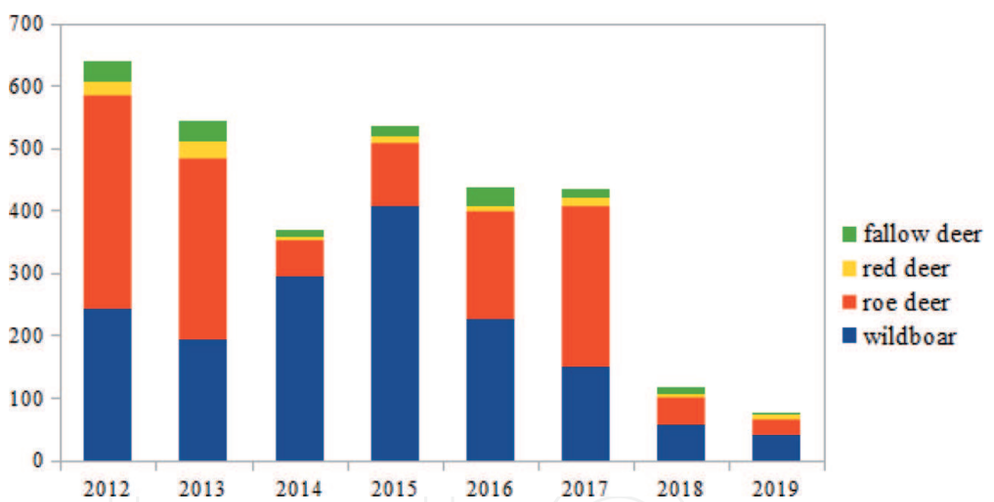

Figure 10.
Traffic accidents involving ungulates.

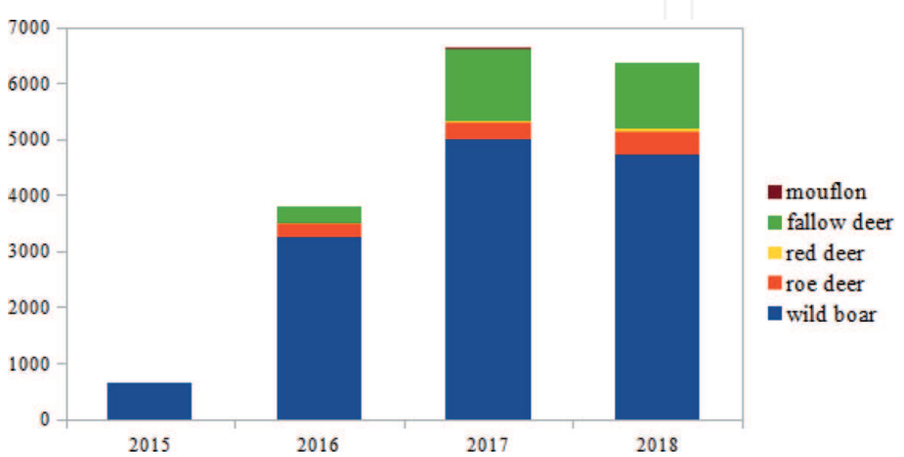

Figure 11.
Ungulate meat supply chain.

3. Conclusion and policy recommendation

As expected, three years were enough to obtain satisfactory results, but social conflicts raised by this law were unexpected. Many economic interests are involved in ungulate management, mostly legal and legit, others illegal, as the meat's black market. Ungulate management, and in particular wild boar management described above, is a strategy that can be replicated in other Italian regions. However, in other countries, its use can be limited by national regulations. Nevertheless, the thread that binds the management of ungulates in different countries, regardless of the regulations, is that to reduce densities, it is necessary to leverage individualism, the possibility of selling culled animals and increasing competition between hunters. From a social point of view, this could be hard to achieve. We often cope with problems caused by ungulates, talking about technical aspects, when most of the management failures are related to difficulties to change hunting traditions based on a conservative approach.

Therefore, it is essential to analyse the socio-economic context on which it is intended to legislate to obtain effective results in the management of ungulates. In Europe, creating a meat supply chain requires more defined and binding legislation capable of overcoming local resistance and promoting a supply chain in which stakeholders will be ready to invest. Politicians, who are sensitive to people's opinions, seek to mediate between what is right and public consensus in the attempt to reach a compromise.

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