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Insight, part of a Special Feature on High Nature Value Farming Systems in Europe

Limited effectiveness of EU policies to conserve an endangered species in high nature value farmland in Romania

Jacqueline Loos [1], *Juliane Gallersdörfer* [2], *Tibor Hartel* [3], *Matthias Dolek* [4] *and Laura Sutcliffe* [5]

ABSTRACT. *Colias myrmidone* is extinct in most European countries of its historic range, and few populations remain in Poland, Slovakia, and Romania. In Romania, this butterfly occurs in traditional farming landscapes of Transylvania dominated by high nature value (HNV) grassland. Parts of these landscapes were recently designated as Natura 2000 areas. In this article, we share insights from our engagement in these Natura 2000 areas, in which agricultural intensification as well as abandonment threaten the survival of *Colias myrmidone*. We unravel which factors hinder the effective conservation of this rare farmland and ecotone species despite the legally binding nature of Natura 2000 and financial support for HNV grassland in Romania through the Common Agricultural Policy (CAP). Firstly, current financial incentives to maintain low-intensity agricultural practices are insufficient to avert land-use intensification or abandonment. Secondly, a lack of knowledge of the wider landscape beyond target areas limits our understanding of population dynamics and dispersal, which impedes the ability to inform conservation management adequately. Thirdly, the target areas have unclear governance arrangements regarding responsibilities and powers, which prevents transparent collaboration and management structures. To improve support for the HNV systems that are crucial for the conservation of endangered species of traditional agricultural landscapes at the local level, we recommend greater collaboration in conservation governance with small-scale farmers, co-development of management plans, and a shift toward results-based payments for conservation actions. At the EU level, we recommend adapting the CAP to genuinely support small-scale farming and to establish a pan-European monitoring scheme for indicator species of HNV farmland such as *Colias myrmidone*.

Key Words: *biodiversity governance; butterflies; common agricultural policy; conservation planning; Colias myrmidone; Europe; grassland; Natura 2000; results-based payments; small-scale farming*

INTRODUCTION

Low-intensity farming practices create and maintain valuable substitute habitats for native wildlife in regions with long histories of agriculture, such as lowland Europe (Wright et al. 2012, Martínez-Abraín and Jiménez 2016). The farmed landscapes of Europe developed as tightly coupled social-ecological systems, where the human–nature interactions for ecosystem service co-production resulted in landscapes with high natural and cultural values (Fischer et al. 2012). Low-intensity farming practices in the European context support a range of species and habitats, including species of conservation interest. This is because of the large amount of native vegetation with diverse successional stages that they maintain, the low level of chemical inputs, and the diversity of structural gradients at the landscape scale (Bignal and McCracken 2000, Halada et al. 2011, Šálek et al. 2018).

However, these biodiversity-rich farming landscapes are threatened by two contrasting human-related land-use change processes that have accelerated over the last century (Donald et al. 2001, Geiger et al. 2010). On the one hand, the intensification of farming practices resulted in a sharp decline of farmland biodiversity in multiple taxa (Stoate et al. 2009, Storkey et al. 2012), including species that were once widespread, such as the skylark (Koleček et al. 2015). These losses can be attributed to the loss and deterioration of native vegetation and structural landscape elements (Tscharntke et al. 2012), increased industrialized agricultural approaches including heavy machinery, and the application of agrochemicals (Matson et al. 1997). However, abandonment also results in landscape homogenization through a reduction in anthropogenic disturbances, which affects farmland species (Cremene et al. 2005). The impact of each driver varies across Europe, with intensification predominantly occurring in areas easily accessible by machinery, and abandonment often happening in difficult terrain and areas remote from urban settlements (Strijker 2005, Faccioni et al. 2019).

In Europe, since the 1990s, low-intensity and often small-scale farming systems have been recognized as high nature value (HNV) farmland for their biodiversity value while simultaneously often representing cultural values through traditional agricultural practices (Beaufoy et al. 1994, 2012). These farmlands are typically highly heterogeneous and host large amounts of semi-natural habitat elements (Beaufoy et al. 1994, Assandri et al. 2018). However, HNV farmland is often unattractive for rural populations in modern Europe under the existing socio-economic conditions, due to its low profitability with simultaneously high demands for manual labor input (Fischer et al. 2012). Many of the species that HNV farmland supports are under threat. One iconic species of HNV farmland is the Danube Clouded Yellow butterfly (*Colias myrmidone* (ESPER [1781])), a formerly widespread species of Central and Eastern Europe that is now one of the most endangered butterfly species in Europe (Freese et al. 2005). Despite having a species action plan for its conservation (Marhoul and Dolek 2012), the conservation prospects for *C. myrmidone* are poor due to loss and fragmentation of habitat such as HNV farmland.

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At the EU level, there are several funding instruments and legal frameworks that are relevant for the conservation of HNV farmland. One of the biggest influencing forces in the agricultural sector in the EU is the Common Agricultural Policy (CAP), which targets the balance between the development of infrastructure and economy in rural areas of EU member states with other elements of sustainability, including sustainable use of natural resources, landscape and biodiversity conservation, as well as climate change adaptation (European Commission 2018). However, the effectiveness of CAP instruments in promoting ecological sustainability is unclear (e.g., Pe'er et al. 2014), and a recent review by the EU Court of Auditors sharply criticized its lack of progress in halting biodiversity decline (European Court of Auditors (ECA) 2020).

Alongside the biodiversity-relevant instruments of EU agricultural policy, one of the core elements of environmental policy is the network of Natura 2000 areas to conserve species and habitats across the EU, legally anchored in the Birds Directive (79/409/EEC) and the Habitats Directive (92/43/EEC). Natura 2000 areas are not strictly protected but allow humans to make a wide range of economic and recreational use of the natural environment as long as it is sustainable (Tsiafouli et al. 2013). The integration of human development and nature conservation in Natura 2000 areas makes them particularly relevant to the concept of HNV, as HNV farming activities create habitats that are also listed in Annex I of the Habitats Directive (Halada et al. 2011, Luick et al. 2012, Popescu et al. 2014). Although the legislature requires member states to designate protected areas for habitats or species of the Annexes I or II of the Habitats Directive and report regularly on their conservation status, the oversight in conservation and management lies solely with the member state (as set out in Article 6 of the Habitats Directive; Evans 2012). Despite the Natura 2000 network covering a relatively high percentage of the EU land area (18%, European Environmental Agency (EEA) 2018), the ability of this network to effectively protect threatened species, including those on farmland, is contested (Kati et al. 2015, Milieu et al. 2016, Rada et al. 2019, Dolek et al. 2020). Critics target the conceptual weakness of the Natura 2000 areas, such as the narrow emphasis on ecology and spatial planning without genuine inclusion of local communities, as well as the lack of effective biodiversity management resources (Popescu et al. 2014, Nastran 2015).

In this insight article, we highlight the specific case of HNV farmland in Romania and its importance for the butterfly species *C. myrmidone* to assess the threats and opportunities offered by EU agricultural and environmental policies and its implementation at the national level in Romania. By examining the critical situation of this endangered butterfly, we show the urgent need to explicitly incorporate coherent support for HNV farmland both within EU-wide and national CAP implementations as well as within national conservation legislation and facilitation. Our insights shared in this article stem from several years of engagement with the CAP, nature conservation, Natura 2000, and butterfly diversity in Romania´s HNV landscapes as well as with the status and decline of *C. myrmidone* in Europe. From 2016–2019, we conducted semi-structured interviews with farmers, NGO members, and representatives of governmental organizations, which helped us analyze institutions linked to the conservation of the butterfly in and around three designated Natura 2000 areas in Romania (Loos et al. 2020; Fig. 1). We discussed the conservation status of the species with experts from other European countries to obtain a European perspective on the urgency of conservation action. We surveyed reference areas as well as the three Natura 2000 areas to provide evidence for its ecology, habitat requirements, and behavior (Loos et al. 2020).

HIGH NATURE VALUE IN THE EUROPEAN UNION AND ROMANIA

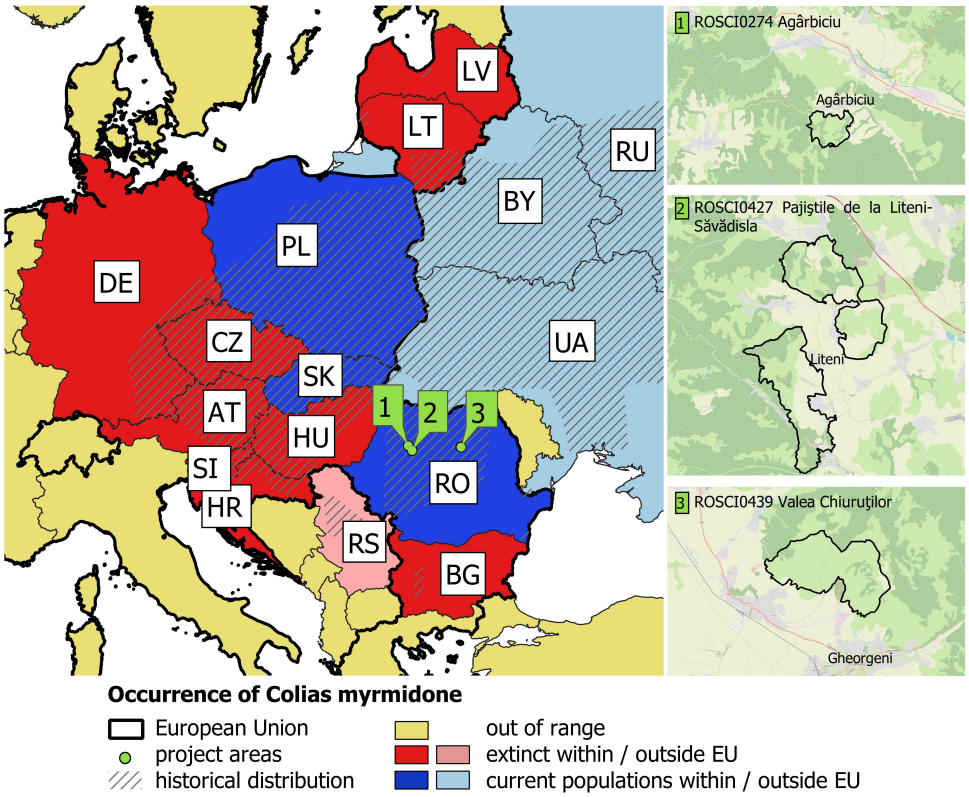
In Europe, the HNV concept is a recognition of biodiversity-rich farmland and does not specify any particular agricultural sector or practice. It has served as one of 35 indicators to monitor and assess the effectiveness of integration between conservation and farming policies since 2007 (Institute for European Environmental Policy (IEEP) 2007). However, HNV farmland is not explicitly supported in agricultural or environmental policy and legislation, despite widespread recognition of its provision of cultural and environmental goods (Keenleyside et al. 2014). The HNV concept lies at the intersection of multiple levels of governance (EU, national, regional) and sometimes comes with conflicting objectives (e.g., rural development, tourism, agricultural productivity, and nature conservation), complicating its use as a conservation target.

Historical, economic, and biophysical factors mean that traditional subsistence and semi-subsistence agriculture is still more common in parts of Eastern Europe compared with the rest of the EU (Sutcliffe et al. 2015, Hartel et al. 2016, Burja et al. 2020). Since joining the EU in 2007, Romania has been considered one of the EU's foremost biodiversity hotspots, particularly in terms of farmland-associated diversity (Loos et al. 2014). Approximately 4.9 million ha of Romania's farmland are recognized as HNV, which translates into 33% of the agricultural area (Paracchini et al. 2008). However, due to unclear definition criteria (Beaufoy et al. 2012), reported values range between 15–39% (Page et al. 2012, Gavrilescu 2017). Particularly in remote areas and economically marginal agricultural lands, farming in rural Romania has prevailed at subsistence and semi-subsistence levels (Burja et al. 2020). Roughly 93% of Romania's farm holdings have less than 5 ha of agricultural land, and the diverging trend of land-use intensification is visible given that 70% of agricultural land lies in the hands of 7% of holdings (European Network of Rural Development 2015).

Colias myrmidone as a Symptom of Dysfunctional Support for High Nature Value Farmland?

In this article, we focus on the tension between modern agriculture and conservation that determines the survival of endangered farmland species. For this purpose, we highlight the case of *C. myrmidone*, a butterfly species that has received more attention than many other invertebrates within Europe in recent years, but whose survival is still at risk. *Colias myrmidone* is considered one of the most endangered butterfly species in Europe (Freese et al. 2005). Once common in large parts of Central and Eastern Europe, it started to decline at the beginning of the 20th century. In 2019, it was noted extinct in eight countries in the EU: Austria, Bulgaria, the Czech Republic (Konvicka et al. 2008), Germany (Freese et al. 2005), Hungary, Lithuania, Serbia, and Slovenia (Verovnik et al. 2011). Populations remain in three EU countries: Poland (Sielezniew et al. 2019), Romania, and Slovakia (Marhoul

Fig. 1. Overview of past and current occurrences of *Colias myrmidone* (left); and project areas in Romania (right). Hatched area of distribution roughly according to Marhoul and Dolek (2012) and Kudrna et al. (2011).



and Dolek 2012), where its status has become uncertain recently. Its status is unknown outside the EU in Belarus, Russia, and Ukraine, and it is not recorded from the Republic of Moldova (Marhoul and Dolek 2012) (Fig. 1). At the EU level, the species is listed as endangered in the Red Data Book of European Butterflies (van Swaay et al. 2010) and also listed under the EU Habitat Directives Annexes II and IV. Due to its rapid decline, a Species Action Plan for Conservation was released in 2012 (Marhoul and Dolek 2012). In Romania and in other EU member states where the species still occurs, it is subject to special protection by national law. In Romania, three Natura 2000 areas in Cluj and Harghita counties have recently been established specifically for the conservation of *C. myrmidone* (Loos et al. 2020).

As with many other farmland species, the survival of *C. myrmidone* depends on low-intensity agriculture at landscape or probably even at regional scales. *Colias myrmidone* naturally inhabits patchworks of forest-steppe, avoiding large completely open habitats (Settele et al. 2009). It requires large populations of its host plant (*Chamaecytisus* spp.; Fig. 2) for the larvae and a rich supply of nectar plants for adults. Females oviposit on the leaves of young shoots of the host plant, the growth of which is stimulated by regular cutting or grazing. However, too frequent removal of the vegetation is detrimental, as eggs and larvae are all situated on leaves close to the tip of the shoot (Marhoul and Dolek 2012). For this reason, *C. myrmidone* may rely on large areas that allow for sufficient supply of young shoots (Konvicka et al. 2008). Mosaic management of the vegetation at intermediate intensity allows the survival of at least part of the population (Loos et al. 2020). Such ecotone-rich habitats would have naturally been produced in areas with disturbance, such as floodplains and steep slopes. With the decline of such natural habitats in the cultural landscapes of Europe, these conditions have been recreated over millennia by traditional small-scale farming. Mosaics of cutting and grazing with trees and shrubs are a hallmark of HNV types 1 and 2 (Oppermann 2012). The conditions needed by *C. myrmidone* also support other ecotone species (Konvicka et al. 2008, Schmitt and Rákosy 2007). As such, we consider *C. myrmidone* a useful bellwether of the recent decline in ecotone-related agricultural biodiversity and the value of HNV farmland to halt this decline.

The majority of *C. myrmidone* observations in our investigations occurred in natural grasslands, but also in areas of cropland interspersed with significant coverage of natural vegetation (Loos et al. 2020). We also observed *C. myrmidone* on low-intensity pastures that receive no artificial fertilizers and typically are stocked with <1 livestock unit per hectare (Page et al. 2012, Sutcliffe et al. 2014). Trees and shrubs were usually present, and

the observations were close to forest patches (<500 m, *unpublished data*). The mosaic landscapes in which we observed the butterfly are characterized by high spatial and land-use heterogeneity (Loos et al. 2020) and are often transitioning ecosystems between forests and grasslands, often lightly grazed by free-roaming animals. This structural complexity provides shelter for the butterfly from grazing pressure, wind, and sun exposure. Moreover, the presence of structures across the wider landscape may be an important element for species dispersal. Based on preliminary investigations by a mark–recapture study in 2018 and 2019 (*unpublished data*), the mobility pattern of this species may be more complex than previously thought: despite being a strong flyer, *C. myrmidone* populations appear to remain rather localized, which may require good connectivity of its habitat patches for its dispersal. In our target areas, we observed ongoing threats through overgrazing but also through shrub and tree encroachment through land abandonment and afforestation. Out of 1894 observations between the years 2011 and 2019, 98% of our *C. myrmidone* observations were on areas that are estimated to be HNV farmland (Paracchini et al. 2008).

Fig. 2. *Colias myrmidone* female on its host plant *Chamaecytisus* sp. (left, photo credit: M. Gascoigne-Pees); and its typical habitat in Transylvania (right, photo credit: M. Dolek).

Current Common Agricultural Program Support Schemes in Romania

The majority of the CAP budget is dedicated to the direct area-based payments (the "first pillar"). These direct payments are currently linked to cross-compliance and "greening" measures, which aim to maintain soil health, structural landscape elements, and permanent grasslands for the purpose of biodiversity and water conservation. In addition, member states can provide a flat rate payment for small-scale farmers (SFS) (European Parliament 2020). In Romania, around 80% of farmers claiming direct support chose to apply for the SFS in 2015 (European Commission 2017). Although securing the active use of farmland that would probably otherwise be abandoned, the first pillar payments in Romania do not directly provide any support for transitional and heterogeneous habitat needed by *C. myrmidone*. They instead encourage uniformity of land use: management is either prescribed (e.g., annual plowing or mowing after a certain date) or proscribed (e.g., the prohibition of productive use of some ecological focus areas). Grassland is eligible for area-based direct payments within the CAP, as long as the density of woody vegetation does not exceed 100 trees/ha. There is, however, no formal recognition of wooded grassland such as that favored by *C. myrmidone* as an agricultural land use, and in Romania, the complete removal of shrubs within the direct payments of the CAP is possible (Beaufoy et al. 2015).

The Rural Development Programme (RDP) forms the "second pillar" of the CAP, in which measures designed individually by each member state address thematic focus areas predefined by the EU, such as biodiversity and improving economic competitiveness. Romania offers several agri-environmental measures under their rural development program, including schemes to support HNV grassland, as well as those targeted at specific bird (corncrake, red-footed falcon, and lesser gray shrike) and butterfly species (Ministry of Agriculture and Rural Development (MARD) 2014). Romania is, as far as we are aware, one of few countries that has implemented an agri-environmental measure particularly tailored for endangered butterflies, mainly aiming at several *Phengaris* species (cf. www.hnvlink.eu/download/Romania_Agro-environmentmeasure.pdf). However, only certain areas of the country are eligible to apply for these schemes, excluding much HNV farmland also hosting butterfly populations (Loos et al. 2014). In contrast, one of our study areas is eligible for the corncrake (*Crex crex*) scheme, despite the fact that corncrake does not occur there. Unfortunately, the management prescribed by the scheme does not support the populations of *C. myrmidone* that prevail on the grasslands and transitional habitats. Thus, the different packages for specific species (i) are restricted to predefined regions (although the target species may also occur or even abound in other regions) and (ii) omit several rare species depending on HNV farmland. Restricting the eligibility to certain districts might be desirable from an administrative perspective but does not promote effective conservation.

In addition, it is unclear whether the management prescriptions within the measures are the most effective way of conserving the species. For example, a rigid measure-based payment in the Czech Republic had devastating effects on the populations of *C. myrmidone* as it destroyed the mosaic of diverse kinds of management (e.g., mowing dates) that created the different successional stages that the butterfly depends on (Konvicka et al. 2008). However, softer management guidelines that are optional but not linked to results can also have very negative effects, as reported for two endangered butterfly species in southwestern Germany by Güsten et al. (2020). We argue that not only *C. myrmidone* but also other species may benefit from the knowledge of local farmers on when and how to manage their land according to their experience. Literature exploring results-based schemes, which depend on decision making by individual farmers to achieve the desired conservation outcome (Matzdorf and Lorenz 2010), suggests that this approach provides many advantages for protecting species that need a range of resources (Herzon et al. 2018). An example of a successful results-based scheme for the Marsh Fritillary butterfly was reported by O'Rourke and Finn (2020) from Ireland. Especially in light of the anticipated future climate change effects on biodiversity, it is important to provide space for farmers to adapt their traditional management not by rigid schemes but by their experience and knowledge of the land (Armitage et al. 2009, Barthel et al. 2013). It needs the right overlap between rigid prescriptions and the freedom to act, together with clear guidance on conservation goals and appropriate monitoring of management to maintain and foster a culture of care in farming landscapes (de Snoo et al. 2013).

The *Colias myrmidone* Natura 2000 Areas in Romania

The designation of three Natura 2000 areas was a mandatory step for Romania in the regions in which the seemingly last populations of *C. myrmidone* occurred, as EU law obliges governments to establish protected areas when highly endangered species that are listed in the Annex II of the Habitats Directive occur (European Commission 1992). This designation (Decree of the Romanian Ministry of Environment, Waters and Forests no. 46/2016) happened in collaboration with researchers, including one of the authors (M.D.). These three Natura 2000 areas overlap by 67% with HNV farmland. Although this overlap may be beneficial for the conservation of *C. myrmidone*, it also requires a careful consideration of national translations of support mechanisms that seek to maintain HNV farmland systems. However, since its declaration in the year 2016, there is neither a custodian nor a management plan in place. This is alarming given the critical status of this species across the EU and the drastic changes happening in the areas where the habitats of this species occur. Regarding the butterfly's preferred ecotone habitat, Romanian wood pastures are not formally recognized within the European Union's Habitat Directives as a habitat type (only for Fennoscandia are they listed as habitat type 9070). Their indirect protection through Natura 2000 support of their habitat is therefore unlikely.

Although the designation of specific target areas for any rare and endangered species is a necessary and promising conservation intervention, species may also rely on the connectivity between various habitat patches to ensure their viability (Hanski et al. 1994). Despite several years of investigations, we do not yet know enough about the dispersal and further populations in the wider landscape to estimate the connectivity between different populations. Observations of *C. myrmidone* by ourselves and others outside of the Natura 2000 areas suggest that it might be necessary to strategically plan its conservation and monitoring beyond protected land, as confirmed by other studies of highly biodiverse regions (Cox and Underwood 2011). In addition, even though historical data suggest the species to be highly mobile (Marhoul and Dolek 2012), there is a lack of clarity about the activity ranges of *C. myrmidone* and its ability to cross unsuitable areas between habitat patches. Thus, if the maintenance of viable populations of this species is the conservation target, efforts are also needed to extend the focus beyond the Natura 2000 framework to take the wider landscape perspective into account.

Planning–Implementation Gap

The designation of the three latest Natura 2000 areas in Romania has happened in collaboration with researchers but without consultation of local decision makers and local stakeholders. One of the major strengths of Natura 2000 compared with other protected areas is the high potential for collaboration among different stakeholders. The lack of communication and involvement of local stakeholders impeded the collaboration between government organizations and citizens in the case of *C. myrmidone*. This missed opportunity reflects two systemic weaknesses: first, a mismatch of priorities and governance principles in integrating rural development with nature conservation goals at a local level and second, a strongly sectorial and "full control" (sensu Caniglia et al. 2017) approach in protected area designation.

Overcoming these weaknesses may be possible through collaborative landscape management approaches (Prager et al. 2012). Ideally, steps to plan, design, and implement collaborative area-based conservation measures at a landscape scale include awareness-raising activities, consultation with local land managers, as well as information exchange with local decision makers to increase the conservation success (Nastran 2015). Furthermore, understanding local socio-economic aspirations, ecological knowledge, and land-use dynamics, which would directly or indirectly benefit the species and habitats of conservation concern, is vital to develop community-based conservation management actions for Natura 2000 areas in cultural landscapes (Hartel et al. 2018). These aspects are especially relevant for *C. myrmidone*, whose populations occur on secondary habitats created and/or maintained by certain land-use practices and social-ecological dynamics. The fact that no management plans have yet been developed in the target areas may result from a lack of understanding of the habitat requirements of *C. myrmidone*, but also shows the lack of clear responsibilities related to the custody of the Natura 2000 areas, as the various existing Sites of Community Importance (SCIs) and Special Protection Areas (SPAs) in the target areas overlap with newly designated areas. Furthermore, changes in the custodianship of the Natura 2000 areas (in 2019, custody was suddenly taken from NGOs by the Romanian government) create dynamics that are conflict laden and represent a major barrier to developing effective conservation strategies. Consequently, different funding schemes are in place for different conservation purposes. Together with the unstable institutional landscape, the situation leaves farmers, decision makers, and advisors confused about the availability of schemes and the institutional support for conservation management. These insecurities, in turn, may influence people's willingness to engage, erode their trust in formal institutions, and ultimately suffocate their agency as small-scale farmers.

To improve the conservation outcomes in these Natura 2000 areas, we highlight the need to promote the agency of local farmers as well as of cross-sectoral institutional structures at local levels. Both of these facilitate pluralistic leadership, which helps locals to navigate challenging social and environmental periods, and multi-level governance, which allows institutions to integrate multiple knowledge types (Watkins et al. 2018).

Rare species such as the butterfly *C. myrmidone*, which depends on low-intensity farming, are in severe decline or highly vulnerable due to changing management. These threats are not caused only by the inherent social and institutional issues these rural regions generally face (i.e., depopulation and land abandonment, social conflicts, institutional misfits; e.g., Mikulcak et al. 2013), but also by the lack of sufficient and clear support by the agricultural and environmental policy within the EU for HNV farmland and its related agrobiodiversity (Gouriveau et al. 2019). The current trend of decreasing expenditures for environmental and biodiversity conservation in Romania (Dinculescu 2019) is a warning sign for more diversified approaches toward supporting small-scale farming in the EU, both for cultural and ecological reasons.

CONSERVATION OF *COLIAS MYRMIDONE* IN ROMANIA

Our insight article highlights the case of *C. myrmidone* as a symptom of a broader social-ecological governance mismatch, both at the national level of Romania and at the level of the EU. Given the urgency to halt further declines in this critically endangered butterfly species in the EU, we derive implications for action at both national and EU levels.

Institutional Capacity Building

Integrating biodiversity conservation goals with farming in cultural landscapes requires the careful orchestration of several policies, goals, and aspirations. A key relational ingredient of this is a high level of trust between different stakeholders and institutional representatives of the different sectors across the various governance levels (Gallo et al. 2018). This is especially important for a species like *C. myrmidone*, which depends on land-use mosaics that are not formally recognized (or are even discredited) as valuable farmland types. For example, small-scale or low-intensity farming is perceived as socially and economically unattractive by many stakeholders outside of nature conservation, which increases land abandonment in marginal agricultural land (McGinlay et al. 2017). This is especially true in social-ecological systems where the socio-economic aspirations are oriented toward the economically developed western countries, but the local communities lack the financial capital to reach these aspirations (Hartel et al. 2018). Based on this, we anticipate that modernization in the farming sector will entail more industrialized approaches to less biodiversity-friendly production and thereby eradicate the cultural mosaic landscapes. In combination with rural exodus and aging farmers (Baker-Smith 2016), it requires a well-designed incentive program to support these small-scale or low-intensity agricultural activities and their heterogeneous structures, probably progressing toward a landscape stewardship program in which people take a key role in governing the landscape, which may support the resilience of the HNV farmland (Plieninger and Bieling 2013).

Colias myrmidone is a rare and endangered butterfly, and its conservation depends on farming types that also generate several ecosystem services and resilient landscapes. Thus, we encourage local communities to create institutional structures that generate co-benefits for the butterfly and people. Examples of the way in which locals could profit from the presence of *C. myrmidone* could be the creation of a local brand for products, educational tourism, and local gatherings centered around *C. myrmidone* and its habitats. These types of activities have far-reaching positive influences on the local communities as well, i.e., through strengthening the social capital (Hartel et al. 2018) and diversifying the human–nature connections (Balázsi et al. 2019). Nevertheless, by creation of a successful event (i.e., "seed", sensu Bennett et al. 2016), these events can have a great inspiring potential for other similar actions (Lam et al. 2020).

Implementation of Holistic Management Plans

Although we consider it important to work on clarifying responsibilities and rights of actors, we also emphasize the need to develop a holistic management plan for the Natura 2000 areas in which *C. myrmidone* occurs, where the values, knowledge diversity, human–nature connections, and social aspirations of the local communities are considered side by side with the ecology of the butterfly. Such management plans can be co-designed (Prager et al. 2012) through voluntary participation and under the auspices of local government organizations as supporting institutions, which may overcome the implementation challenges in Natura 2000 areas (Blicharska et al. 2016).

Rather than rewarding interventions as such in the management of the Natura 2000 areas or the HNV farmland, a fragile species with still unclear habitat requirements may be better served through results-based payments, which provide cost-effective incentives for farmers to intervene in a way that is favorable for the species (Matzdorf and Lorenz 2010). As a potential inspiration for implementation, result-based payments for biodiversity have been piloted in two regions of Romania (Fundatia Adept 2015). However, we acknowledge the limitations of the payment-based conservation activities (de Snoo et al. 2013) and emphasize the importance of increased societal recognition of low intensity, heterogeneous farmlands for their conservation value. In addition, issues such as the development of good result indicators reflecting diversity across taxa without being too simple or too complicated and the farmers' fear of ending up without payment even though they adopted their management have to be resolved.

CONSERVATION OF *COLIAS MYRMIDONE* IN THE EUROPEAN UNION

Most HNV farmlands are subsistence or semi-subsistence systems that typically evolved from centuries-long human–environment interactions in cultural landscapes (Balázsi et al. 2019, Rolo et al. 2020). Although rich in biodiversity and with high environmental resilience potential at regional and continental scales (Fischer 2012, Barthel et al. 2013), the farmers inhabiting and sustaining these landscapes often have socio-economic aspirations with consumerist types of ideals (Hartel et al. 2018). This situation typically results in land abandonment (through emigration of the young people when no satisfactory economic incomes are available at the local level) or land-use intensification (through land grabbing or adopting mechanized agriculture) (Hartel et al. 2018, Burja et al. 2020). This hidden threat to the traditional farming landscapes highlights the need for careful harmonization of legitimate economic development goals with the maintenance of landscapes with high natural and cultural value.

Common Agricultural Program Restructuring to Support Small-scale, Low-intensity (High Nature Value) Agriculture

Whereas the effectiveness of the CAP to genuinely support biodiversity is tenuous (Pe'er et al. 2019), the support for livelihoods and genuine consideration for food security and landscape conservation could also be improved (Babai et al. 2015). Although the CAP might just form one of various pathways for more integrated governance of conservation and development (Leventon et al. 2019), there is also a lot of potential to integrate rules and regulations for the benefit of both people and farmland biodiversity through its instruments. The fact that HNV farmland is not explicitly mentioned in the CAP reform proposals released by the European Commission in June 2018 (Gouriveau et al. 2019, European Commission 2018) disadvantages countries such as Romania that have integrated the concept into their rural development program already. Given the increasing understanding of farmland as an important contributor to European

biodiversity, this lack of political recognition sends out the wrong signal for nature conservation in rural, highly biodiverse areas.

Monitoring System

Our observations of occurrences of *C. myrmidone* have largely been possible through expert volunteer engagement and on a small budget. There is, however, a compulsory monitoring requirement according to article 17 of the Habitats Directive, and Romania has delivered its data for the last reporting period 2013–2018, for which preliminary summaries are available (EEA 2019). The overall assessment for *C. myrmidone* in Romania is clearly unfavorable. There is an extensive documentation about what kind of data member states deliver, but details of data collection in the field remain undocumented. For a robust monitoring scheme of *C. myrmidone*, we consider two distinct sets of monitoring necessary for conclusive tracking of population changes. Firstly, the observation and estimation of larval development stages in the target areas may help calibrate grazing intensity levels and appropriate timing of grazing (Konvicka et al. 2008, Szentirmai et al. 2014). Secondly, assessments of relative abundance and rough population size estimates, e.g., by standard transect counts, may be useful to assess population viability and habitat suitability in the remaining three member states where the species still occurs. Especially in Romania, exploring additional suitable areas may uncover some as-yet undetected populations. Additionally, we recommend mapping the species in its Eastern European strongholds outside of the EU to gain an understanding of potential declines and to evaluate its status in these regions.

The Potential of High Nature Value Farmland in Europe to Conserve Ecotone Species

Although many benefits of HNV farmland are recognized, current schemes, at least in Romania, seem to fail to support large amounts of HNV farmland. Among these are ecotone areas, which are transitioning zones between biotopes, including wood pastures, forest edges and semi-open landscapes (Walz 2015). Rigid guidelines on mowing dates and shrub elimination, but also counterproductive support for afforestation, lead to an erosion of transitional habitat (Konvicka et al. 2008). Moreover, the current funding opportunities for younger farmers and farmers operating at very small scales seem insufficient to prevent land abandonment or loss of low-intensity practices through intensification. Despite not being a farmland indicator species, the case of *C. myrmidone* highlights the urgent need to better align agri-environmental schemes with nature conservation targets to make HNV farmland a refuge for endangered ecotone species, such as those related to transitioning farmland–woodland landscapes as represented by low-intensity, small-scale farming systems in Transylvania.

CONCLUSION

Both short-term and long-term adjustments of policy and governance are necessary to protect *C. myrmidone* in some of its last strongholds in Romania. We recommend approaching conservation management of the species from three different angles in Romania. First, the collaboration between local governments, researchers, the local populations, and NGOs needs strengthening to raise awareness and foster local participation. Second, within this collaboration, the development and implementation of ecologically and socially feasible management plans is urgently needed. Third, a payment scheme based on conservation outcomes may allow for the application of traditional ecological knowledge and encourage adaptive management regimes of the wooded grassland ecosystem that *C. myrmidone* relies upon. Although measures like the HNV farming concept within the CAP are in place to preserve semi-natural habitats at EU and at national levels, current policies still disadvantage small-scale low-intensity farming in a way that threatens the persistence of some of the most endangered species in Europe. In the long term, EU's CAP needs to revise its mechanisms to genuinely support small-scale low-intensity agriculture to maintain or restore biodiversity associated with farmland and the semi-natural elements contained within it.

Responses to this article can be read online at:
https://www.ecologyandsociety.org/issues/responses.php/12489

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Data Availability:

Not applicable.

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