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Commentary to the major considerations by the examiners

Examiner 1:

No comments needed to be addressed.

Examiner 2:

No comments needed to be addressed.

Examiner 3:

Candidate Contribution to the research
I found it very difficult to assess the contribution made by the candidate towards the research, particularly in light of the fact that the data was collected between 2008-2012 (before the candidate registered for a PhD I would imagine) and since all data chapters are multi-authored (which I fully understand), I think it imperative that the contribution made by the candidate is explicitly conveyed to the examiners. From a quick author scan (Scopus) it is clear that the candidate has been involved with this mouse system and research group for many years and therefore I do not doubt his knowledge of the system nor his research topic but his contribution must be made clear (not only with respect to his supervisors but also relative to that of his wife who is also a co-author?) and how this body of work aligns with the bigger collaborative project. The faculty documents clearly state that: "a candidate may include published results or publications, provided that this work was undertaken during the course of the candidature. In the case of joint publications also included, the candidate's share in such work must be indicated".
I have been a member of the striped mouse team since 2006 and have been the research station manager since 2007 until the commencement of my PhD. In the years prior to the beginning of my PhD thesis I lived on site at the Succulent Karoo research station in the Goegap Nature Reserve, where all data was collected. Some of my duties as manager included gathering data for various studies performed on striped mice at the station during the years. This did not simply entail data management, but required active participation in all aspects of data collection, including radio-tracking, performing behavioural observations, trapping, handling and blood sampling of mice and as I have been a co-author on several papers published by this research group prior to the beginning of the thesis. As such I am very knowledgeable about this species. Indeed some of the data collection was gathered before the start of my appointment as a PhD candidate at the University of the Witwatersrand. Gathering data from wild individuals directly in their natural environment is in itself quite challenging, and for the purposes of my study I aimed to collect data from the same individuals repeatedly. This necessitated catching individuals on multiple occasions, which was a very long and tedious process. Before I set out to do the study I did not know whether striped mice had personalities. The idea to research personality was indeed there before the starting of the thesis, but in order to turn this "idea" into a study worthy of a PhD thesis, it was necessary to assess beforehand whether the concept had any foundations; as such, the data collection part of the project had to be started before the thesis in itself. All the concepts development, data analysis and writing of the thesis (including writing of publications) were performed during my enrolment in the PhD program. Regarding my contribution towards the research, I developed all the concepts and protocols for testing personality in striped mice (including validation

procedures, design of field and captive tests), collected and analysed the data, and wrote all the manuscripts for publication and the thesis. My wife, Dr. Schoepf, a postdoctoral fellow in evolutionary endocrinology at Virginia Tech in the USA, is an expert statistician, and provided assistance during data analysis, particularly with the use and implementation of advanced statistical modelling in R. Dr. Schradin assisted with discussion and guidelines with some of the concepts and allowed me to carry out the data collection for my thesis at his field site. Prof. Neville Pillay provided overall supervision and offered the funding, which made the research possible.

General Comments

1) *So personality is expected to limit the degree of behavioural flexibility (which is understandable) but you express this constraint in terms of social flexibility. These terms are not necessarily interchangeable (and if they are then that has to be clear) and I think it is important that this is explicitly defined, in light of your interpretation, in chapter 1. The terms are described better in chapter 2. This highlights the importance of indicating the contribution made by the candidate relative to co-authors in the multi-authored publications? You raise this again in your discussion chapter highlighting the importance of clearly defining this terminology.*

   Please see my response above regarding my contribution to the research. Regarding the definitions of terms, because the thesis incorporates published manuscripts, I wanted the introduction and discussion chapters to be as concise as possible, to try and avoid redundancy for the reader. I realise now that this has resulted in some of the concepts not being clearly fleshed out in these chapters. I have addressed this point providing more information in chapter 1 in the following way:

   Page 4 and 5: "Behavioural flexibility allows individuals to respond quickly and adaptively to challenges in the environment, and as such it should be favoured by selection. Yet, individuals show great variability in their ability to mount behavioural responses, even when confronted with same environmental challenge (e.g., individuals facing a decline in resources availability within the same habitat). This is because producing a flexible phenotype is costly and, thus, different individuals may be constrained in their ability to be flexible depending on their life-history (Hazlett 1995; DeWitt et al. 1998; Dall et al. 2004). Several studies have now shown that there is not only a between-individuals difference in behavioural responses to challenges, but also that these behavioural differences are consistent (i.e. individuals have different personalities). In other words, an individual may be able to adjust its behaviour when conditions in its environment change, but still show a consistent level of response relative to those of other individuals in the population (Johnson and Sih 2007; Dingemanse et al. 2010). Thus, studying the link between behavioural flexibility and personality may elucidate why individuals show such a variability of responses to changes in environmental conditions. The vast majority of studies have investigated personality and behavioural flexibility in species that are not especially well known for having either. Yet, if we are to understand the contribution of both to produce variable individual responses, they need to be studied concurrently. To understand the link between behavioural flexibility and personality would therefore be better if this topic were addressed using a species where personality was well-developed, but also that show high degree of flexibility in its behavioural responses. Socially flexible species are great candidates to study the link between personality and behavioural flexibility because individuals of these species show alternative phenotypes that are highly plastic and adapted to the environmental conditions to which they are exposed. Most importantly, individuals of socially flexible species are able to respond to changes in their environment by facultatively switching back and forth between alternative phenotype when conditions change (Schradin et al. 2012). As a result of adaptations arising in response to changes in the environment, the entire social system of these species can change. While socially flexible species may provide great model organisms to study behavioural flexibility and personal-

ity, to date, they have been used rarely to address this topic (Zimbardo 1995; Arnold and Taborsky 2010; Le Vin et al. 2011), with different studies producing conflicting results."
Page 8: "Most interestingly, striped mice following different social tactics also differ considerably in their behaviour. For example, individuals that follow a solitary tactic are also more aggressive than individuals that follow a group-living tactic (Schoepf and Schradin 2012b). Remarkably, however, individuals are able to change their behaviour according to the tactic they adopt. During a field experiment where population density was manipulated, Schoepf and Schradin (2012a, b) found that group-living individuals that dispersed from their natal nests and became solitary also changed their behaviour. Specifically, striped mice became more aggressive towards same-sex conspecifics, were more socially investigative and were more amicable to opposite-sex conspecifics when they changed from group-living to solitary-living. Further, individuals that would go on to become solitary were more aggressive than their siblings that remained group-living even before the former became solitary, with this difference becoming more prominent after the adoption of a solitary tactic (Schoepf and Schradin 2012b). These findings demonstrate high flexibility in the social behaviour of striped mice, which could also indicate higher flexibility in personality traits, and thus absence or reduced stability of personality, especially over longer periods that include changes of reproductive tactics."
The following information was included for chapter 5:
Page 117: "In chapter 2, I set out to investigate the link between behavioural flexibility and personality using the African striped mouse, a species well-known for its high social flexibility. African striped mice proved to be an excellent study system to investigate this topic, because individuals of this species are able to switch between different alternative reproductive tactics according to changes in environmental conditions. For example, individuals can switch from the group-living to the solitary tactic when population density declines (Schoepf and Schradin 2012a). As a consequence of this switch, the entire social system of the population can change. Striped mice following different reproductive tactics also differ considerably in their behavioural traits, but interestingly, these behavioural differences can become more or less apparent depending on which tactic is adopted (Schoepf and Schradin 2012b). Thus, striped mice show high flexibility in their behavioural traits, but most remarkably, this flexibility is also linked to their personality, with individuals showing consistent behavioural shifts (e.g. being always the most aggressive) when compared with other individuals within the population."

2) *The issue of behavioural flexibility and plasticity has not been argued convincingly.*
I provide a more exhaustive definition of behavioural flexibility and plasticity on page 4: "Behavioural plasticity is defined as the ability of an individual to alter its phenotype in response to changing environmental conditions so to maximise its fitness (e.g. enhanced survival probabilities, increased mating probability, etc.; Schlichting and Pigliucci 1998; West-Eberhard 2003). Behavioural flexibility is a similar term, and in the literature the two terms have been used interchangeably (e.g. Holekamp et al. 2013), yet behavioural flexibility differs from behavioural plasticity in the fact that behavioural flexibility specifically refers to the ability of individuals to facultatively and reversibly change their phenotype in response to changes in their environment. The key aspect here is the ability of individuals to switch back and forth between phenotypes. Behavioural plasticity is a more general term, which in addition to the above, also includes examples of individuals with developmental plasticity, arising during ontogeny when one of several alternative tactics are developed and maintained into adulthood (Piersma and van Gils 2010). Here, I treat the two terms as being separate and distinguish behavioural flexibility from behavioural plasticity in the fact that behavioural flexibility allows for behavioural adaptation that are reversible."

3) *The in-text referencing has no consistency. On occasion it is done alphabetically, then by date and in some instances, there is no pattern.*
I checked all the reference in the text and formatted them consistently.

4) *I have raised editing issues but there are still spacing issues, pagination, the consistency of using Z and S, i.e. categorised but analysed.*
All the spacing, pagination issues have been resolved.
The analysis for the first paper was based on raw untransformed data and for that, we had to use different types of models according to whether the data were categorical or continuous. On page 38, I report F scores for model analysis of activity, boldness and exploration, but a Z score for model analysis of aggression. The reason for this is because aggression was analysed using zero-inflated models, which correct for the high number of zeros in the data set. This type of analysis does not report F scores, only Z scores. The other chapters were analysed by first calculating behaviour/per minute. I did so to be able to compare measures of laboratory tests with measures from field tests. So, all the models used in chapter 3 and 4 are based on analysis of behaviour/minute and are thus different from the results presented in chapter 2.

Specific comments

Chapter 1

Page 1: pace of life (hyphen missing between pace and of). Corrected.

Page 3: "Finally, a few studies have recently also ~~uncover~~ confirmed (or revealed) personality over long-term developmental phases,..". Changed.

Page 3: "The study of animal personalities aims to understand how behavioural traits co-vary within individuals and which evolutionary processes might generate such trait variety". Is it really variety? Should the term not be variability? Yes, the correct term is variability. I replaced the word variety with variability where necessary in the thesis.

Page 3: "The persistence of sub-optimal behaviour within wild populations has been linked to the existence of ~~personalities~~ differences in personalities among individuals.". Corrected.

Page 3: "Bettered mating chanced" replace with increased mating probability/likelihood. Replaced.

Page 4: "here, I treat them as two separate concepts and distinguish behavioural flexibility from behavioural plasticity in the fact that it does not assume genetic variance". This is not adequately explained and a more satisfactory justification is required. Further, this is particularly important, since one of the aims analysed the link between behavioural plasticity and social flexibility. A clear distinction between behavioural plasticity, flexibility, social flexibility is needed. And I am not sure I agree that you don't use these terms interchangeably (see chapters 2 and 3).

I provide a more precise definition of the terms "behavioural plasticity" and "behavioural flexibility" on page 4 and of the term "social flexibility" on page 5 (see details above). I also revised the entire thesis and made sure that the terminology is consistent throughout.

Page 4: "One problem field scientists face is how to reliably collect data from their study animals which ~~are~~ is representative of the behaviour…". Corrected.

Page 5: " and 2. Testing only one trait per day is often not applicable (maybe a better term would be appropriate?) for most field studies…. I have replaced the term "applicable" with "achievable". *In the second case, field researchers have to be content with trapping/observing a single individual twice to test for consistency in one behavioural trait, but to trap/observe an individual repeatedly over several days is unlikely to be feasible for many species." I do not find this argument easy to follow.*

I re-wrote the sentence in the following way: "In the second case, field researchers need to be able to catch individuals repeatedly to be to test for consistency, but this can be very difficult to achieve over a period of several days and is unlikely to be a feasible method for many species."

Page 5; "it would be important therefore to test whether conducting measurements of several behavioural traits in ~~in~~ quick succession is as reliable as having intervals between tests". Corrected.

Page 5: Springbok (41.56S, 1.60E). – this is not correct. The coordinates have been changed for the correct 29.6830° S, 17.9640° E

Page 6: "Females typically give birth to litters of 2-5 pups". Corrected.

Page 6: Regarding your reproductive strategies, young philoptaric adults are non-breeders while the other two strategies are breeders? Can you switch continuously between solitary and communal depending on population demographics? Which breeding strategy is more successful, communal or solitary?

Different tactics are associated with differences in the degree of reproductive success, with communally-living breeders typically having the highest reproductive success, solitary-living individuals having intermediate reproductive success and group-living philopatrics having very low reproductive success (Schradin et al. 2012). Interestingly, however, when population density decreases, communally breeding and solitary individuals have similar reproductive success (Schradin and Lindholm 2011). Interestingly, even typically non-breeding philopatrics have been shown to have some degree of reproductive success (Schradin and Lindholm 2011), highlighting the fact that remaining as a philaptric in the natal group can be considered a true alternative reproductive tactic. This information has been added to the thesis on page 7.

Yes, individuals can switch back and forth between tactics depending on the population demography (see Schoepf and Schradin 2012 for details).

Page 7: Aim 6, delete the "and". Deleted.

Page 8: "I investigated whether testing free-living striped mice sequentially for the <u>three</u> different personality traits on one day would yield the same results as testing them on different days. The personality traits investigated were: <u>activity, boldness, exploration and aggression</u>. You refer to 4 traits but indicate that 3 traits are investigated. I realise boldness and activity can be grouped but this needs to be highlighted if that is the case? In your data chapters, you treat the 4 personalities independently. You need to reduce confusion.

This was in fact a mistake on my part. As pointed out by the examiner I investigated four distinct behavioural traits: activity, boldness, exploration and aggression. I never grouped activity and boldness together. This error has been corrected.

Page 9: "Objective 3: can an individual's specific personality predict which tactic he/she will adopt later in life? Predictions: Group-living striped ~~mouse~~ mice are known." Corrected. *Also this prediction is only made for males (see page 26). I think you need to be more specific here.*

The initial idea was to be able to test this in males, but also females. However, during data collection I captured very few females that became solitary-living, and as such the analysis of females had to be omitted from the thesis. I have now changed Objective 3 to focus most specifically on males.

Page 10: First paragraph, must be a comma between the most active, the boldest…. Comma added.

Page 11: "in chapter 2…..showed consistency over time and across context and analysed the link between personality, (comma) behavioural plasticity and social flexibility. Comma added.

Page 11: "in chapter 3, I addressed aims 4 and 5. It includes all comparisons between personality traits of striped mice when tested under standardised conditions in a neutral presentation arena in the laboratory and ~~in~~ directly in their natural habitat". Corrected.

Page 11: "In chapter 4, I assessed whether boldness measured with an open field <u>test</u> yields the same results if boldness were measured using a startle test, addressing aim 6." The word "test" has been added.

Page 14: Magnhagen C, Wacker S, Forsgren E, Myhre LC, Espy E, Amundsen T (2014) Context Consistency and Seasonal Variation in Boldenss of Male Two-Spotted Gobies. Plos ONE 9:10 (Title is capitalised). I have changed the title so that is no longer capitalised.

Chapters 2 & 3
These chapters have been published in Behavioral Ecology and Sociobiology in 2015 and 2016. Consequently, I don't see any justification in commenting on originality (it has been published so it speaks for itself), experimental design, statistical analyses, interpretation and evaluation. Any comments/suggestions would in essence be futile since these data are already published.
However, see my comment above about the candidate's contribution to these multi-authored publications.
Please see my answer above regarding my contribution to the research presented here.

I will highlight some changes (accurateness and editorial corrections) required:
Page 20: "Indeed, an individual may adjust its behaviour in response to different situations but still show a consistent level of response relative to the responses of other individuals (Johnsons and Sih 2007; Dingemanse et al. 2010)". A space required between 2007 and Dingemanse. Corrected.
Page 20: "…striped mice can either live solitarily or form extended family groups with communal breeding, helpers at the nest and paternal care (Schradin 2005; Schradin and Pillay 2004, 2005; Schradin et al. 2006; Schoepf and Schradin 2012a). A space required between year and author. A space has been inserted.
Page 25(c) Method validation for the study of personality in striped mice. I am interested as to why the personality tests were not randomised? Is there a reason why they are tested sequentially for boldness, exploration and aggression?
Boldness was tested first because we wanted to assess the behaviour of an individual when confronted with an open space, thus determining its willingness to take risks. We wanted to be able to distinguish this behaviour from exploration, where the individual was exposed to a novel object, where the only novelty in the exploration had to be the novel object in itself and not the novel space. Aggression was tested last because the introduction of a stimulus individual in the area also was accompanied with the introduction of a novel scent, which would have affected risk-taking and exploratory behaviours if these tests were conducted in a random fashion.
Page 27: R2 needs to be R^2 throughout. I changed throughout the thesis.
Page 28: "A total of nine philopatric males that would later adopt a roaming tactic were measured against nine philopatric males that would later adopt a breeding tactic". On page 26 you indicate that 13 males and 13 males were compared? The sample size is different for the two different tests because in the second analysis I included all philopatric individuals which went on to change their reproductive tactic, but which I was unable to re-capture repeatedly after they had adopted the new tactic.
Page 29: "Figure 1 shows ADD boldness R = 0.71 ± 0.13, 95% CI 0.39-0.87, P = 0.001. This error has been addressed.
Page 38: Table 1 heading needs R2 to change to R^2. Changed
Page 39: Table 2 heading needs R2 to change to R^2. Changed
Page 40: "In sum, we demonstrated that personality, a form of individually constrained behaviour, exists in a species characterised by high behavioural flexibility." It brings me back to the point of the behavioural flexibility (behavioural plasticity) and social flexibility that I raised earlier. These terms need to be carefully defined and consistently used.
I defined this terminology in chapter 1 (see details above) and I revised the entire thesis to make sure to always use consistent terminology throughout.
Page 41: "Activity, boldness and exploration might be therefore particularly important in female ~~mice~~ striped mice as these personality traits might allow gestating and nursing individuals to be able to locate food resources more effectively". Corrected.
Page 41: "neighbouring and unfamiliar males (Schradin 2004; Schradin et al. 2010b). Space needed. Space inserted.

Page 42: "there are important differences in the way personality is maintained within the sexes in stripedmice," (striped mice). Corrected.
Page 56: In figure 1 legend you indicate that the ΔAIC and Akaike weights are provided. They are not. I don't think you have given the ΔAIC values and you certainly have not included the weights. I have now added the ΔAIC and Akaike weights to the figure.
Page 57: The coordinates for Goegap Nature Reserve cannot be correct. I have modified the coordinate to the correct ones.
Page 57: "Stripedmice at our field site.. AND All stripedmice fitted with a transmitter…" (striped mice). Corrected.
Page 57: "using anAOR8000 wide range receiver…." – space needed. Space inserted.
Page 58: Space between 2 and weeks. Space inserted.
Page 58: "(115x20x44mm),which was" – space needed. Space inserted.
Page 59: Why are the sample sizes for each personality test different if each focal mouse was sequentially tested for a) activity and boldness, b) exploration, and c) aggression? Is it for matched pairs in the field assays? Yes, this was the result of matched pairs between laboratory and field tests. When I conducted behavioural tests in the field, I was not always able to observe the same individuals that I had tested in the laboratory and vice versa.
Page 59: You state you recorded mouse activity/inactivity per minute and calculated the percentage of the 180 recordings from the 6-h observation that the individual had been active. Would you not have 360 recordings over 6 hours? Otherwise I am confused.
I recorded 6 hours of activity, but for the purpose of the analysis and to keep consistency with the data collected in the laboratory, I only included data gathered during morning observations when individuals were only followed for 3 hours.
Page 62; R2 should be R^2. Corrected.
Page 63: "including the random effect of mouse ID in our LMM improved model fit for activity" – delete space. Space deleted.
Page 63: and throughout the Results section, all R2 should be R^2. Corrected.
Page 64: Table 2 legend is not sufficient or you need a footnote explaining what the values are. I have added the following foot note: "Estimates were derived separately for each behaviour. Each model included mouse ID as the random factor, while test (first or second) was the fixed effect. For each model, we report point estimates for the fixed (mean) and the random parameters (variance) along with their 95%confidence intervals."
Page 67: Table legend 3, must state what you are reporting in the table.
I have added the following footnote: "Each of these models had one of the behavioural scores measured in the nature (e.g. activity) as the response variable and the corresponding measured score for that individual's behaviour in the arena (e.g. activity in the laboratory) as the fixed factor. Individual ID was entered as the random factor in each model. For each model, we report point estimates for the fixed (mean) and the random parameters (variance) along with their 95%confidence intervals."
Page 67: "However, the cross-context correlation between the latent variables of field and laboratory was rather strong ($z = 5.16$, $p < 0.0001$), suggesting that model 4 was a better fit for our data (Fig. 21). This model predicted that two correlated context-specific separate latent variables underpinned all the behaviours (Fig. 4)." ***Why then is figure 4 the model of a single latent variable and not one of two correlated context-specific separate latent variables****? Makes no sense.*
I made the necessary corrections to the text and replaced the figure with the correct one.
Page 73: "This has resulted in a surge of studies testing for consistency among the two context, with different…". Maybe: This has resulted in a surge of studies testing for consistency across context OR context needs to be contexts. Changed.
Page 78: Verbeek et al 1999, Behaviour needs to be in italics. Corrected.

Chapter 4

Page 82: Opening sentence should be "topics"; invertebrates should be "invertebrate". Corrected.
Page 83: The last sentence of the 1st paragraph reads oddly. I re-wrote the sentence in the following way: "Finally, extrinsic factors (e.g. environmental conditions, food availability and predation; Lopez et al. 2005; Nelson et al. 2008) and intrinsic factors (e.g. age, experience, hormone levels and sex; Boissy 1995; Sinn and Moltschaniwskyj 2005; Frost et al. 2007) affect boldness at the phenotypic level."
Page 84: the coordinates? The correct coordinates have been provided.
Page 86: "In the laboratory, boldness measures ~~obtained~~ using startle tests were obtained by recording the latency (in seconds)…." Deleted.
Page 88: R2 must be R^2 and that is true for all R2 in results section. Replaced.
Page 89: Table 1 legend should read "open field and startle tests". Corrected.
Page 92: "c) Models, which included the fixed effect of laboratory better explained our data than models without them for both ~~for~~ the open field and startle tests." Corrected.
Page 95: "highly repeatable within the same context (laboratory or nature) and ~~over contest~~ across context (laboratory and nature)." Corrected.
Page 95: "In the open field test, there was no-prior exposure to an imminent threat.," Delete one of the full stops. Deleted.
Page 96: They ~~and~~ attributed the differences to the fact that bolder animals… of a novel task more…". Deleted.

<u>*Chapter 5*</u>

1) *You indicate that you show two latent variables underpinning the behaviours measured in two contexts, yet you present a single variable model in chapter 3?*

The incorrect figure had been inserted. I have now corrected this and present a figure where two latent variables are underpinning the behaviours measured in the two contexts (see details above and Chapter 3 page 70 of the thesis for the correct figure).
The fact that you find consistency across context but that syndromes were context specific is interesting. You also state, "This is remarkable because one would expect that if all the behavioural traits measured within one context are consistent when measured in another context, the correlation arising between them (i.e. their behavioural syndromes) should also be similarly correlated. ***Why do you think this is the case?***
Consistency of personality traits and stability of syndrome structure arising from said traits has been shown in several studies. I added the following paragraph in chapter 5 on page 112 in support to my statement: "This because individuals' personalities can be expected to fall along the so-called reactive-proactive behavioural syndrome continuum, where proactive individuals are able to control their environments, while reactive individuals respond more passively to their environments (Sih et al. 2004). Consistency in personality traits and stability in syndrome structures has been shown in several species, such as the brown trout (*Salmo trutta*; Adriaenssens and Johnsson 2012), hermit crabs (*Pagurus bernhardus*; Mowles et al. 2012) and rock pool prawn (*Palaemon elegans*; Chapman et al. 2013)."
In this discussion, you should critically interrogate your results and not simply summarise the previous chapters.
I also added the following paragraph to the discussion regarding behavioural syndromes: "However, other factors, putatively the role of genes as opposed to previous experiences, as well as the degree of behavioural flexibility may affect the way an individual responds in different environments (Briffa et al. 2015). Further, physiological constraints, such as those imposed by metabolic ceilings may constrain behaviours in one environment versus the other (for example, temperature fluctuations in the natural environment versus constant temperature experienced in the captive environment) and may cause the correlations between the different behavioural traits to disappear as individuals are measured in two

different contexts (Careau et al. 2008). It is therefore plausible that syndromes themselves can be variable and can change across situations."

Further in this chapter you raise the idea of sexual selection shaping personality in striped mice. Again an interesting finding that you need to explore more thoughtfully. Remember that you may offer some speculation in this chapter indicating that you have grappled with these findings.

I added the following paragraphs to the discussion regarding sexual selection in Chapter 5 on page 113: "A study in Namibian rock agama, *Agama planiceps*, found that males show fitness trade-offs between boldness and time budgets, feeding rates, territory size and predation risk (Carter et al. 2012). Specifically, the study found that bolder males basked and moved more, fed more and had larger territories but had more predator-related injuries than shyer males (Carter et al. 2012), but also that personality differences in their risk-taking behaviour varied according to whether individuals were measured during or outside the reproductive season (Carter et al. 2012). Further, studies in rock pool prawns have also revealed that while syndromes can be stable over different contexts, males and females display sex-specific syndromes (Chapman et al. 2013). My results in striped mice suggest that sexual selection may be responsible for producing differences between males and females in investing in the same behaviour (e.g. exploration) and that there might be costs and benefits associated to said behaviour according to which sex is expressing them. For example, being overtly explorative may be too costly in terms of predation risks for females particularly during the reproductive season, when they have to raise dependent pups."

2) *You indicate that the findings will be united under the "conceptual personality framework". What is this framework? This is the first time you mention it.*

I was referring to my validation method, which I propose could be used as a reference and guideline for future studies investigating personality of wild-caught species. I realise the above-mentioned is not clear and I have deleted the term "conceptual personality framework" from the sentence.

3) *On page 6, 3rd paragraph. "This is ~~an~~ a significant findings, because…* Corrected.
4) *The paragraph preceding the "ubiquitness of personality in nature", last sentence should read "studies", also, keys should be singular, "are key in understanding", should read "standardised laboratory setting"; Page 109, "While great strides have been made…" not having been….* Corrected.
5) *Biro and Stamps 2010. Journal name is not italics.* Corrected.