

**Stellungnahme zum
Zoologischen Forschungsmuseum Alexander Koenig
- Leibniz-Institut für Biodiversität der Tiere (ZFMK)
Bonn**

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Vorbemerkung

Die Einrichtungen der Forschung und der wissenschaftlichen Infrastruktur, die sich in der Leibniz-Gemeinschaft zusammengeschlossen haben, werden von Bund und Ländern wegen ihrer überregionalen Bedeutung und eines gesamtstaatlichen wissenschaftspolitischen Interesses gemeinsam gefördert. Turnusmäßig, spätestens alle sieben Jahre, überprüfen Bund und Länder, ob die Voraussetzungen für die gemeinsame Förderung einer Leibniz-Einrichtung noch erfüllt sind.¹

Die wesentliche Grundlage für die Überprüfung in der Gemeinsamen Wissenschaftskonferenz ist regelmäßig eine unabhängige Evaluierung durch den Senat der Leibniz-Gemeinschaft. Die Stellungnahmen des Senats bereitet der Senatsausschuss Evaluierung vor. Für die Bewertung einer Einrichtung setzt der Ausschuss Bewertungsgruppen mit unabhängigen, fachlich einschlägigen Sachverständigen ein.

Vor diesem Hintergrund besuchte eine Bewertungsgruppe am 14./15. Februar 2013 das Zoologische Forschungsmuseum Alexander Koenig (ZFMK) – Leibniz-Institut für Biodiversität der Tiere in Bonn. Ihr stand eine vom ZFMK erstellte Evaluierungsunterlage zur Verfügung. Die wesentlichen Aussagen dieser Unterlage sind in der Darstellung (Anlage A dieser Stellungnahme) zusammengefasst. Die Bewertungsgruppe erstellte im Anschluss an den Besuch den Bewertungsbericht (Anlage B). Das ZFMK nahm dazu Stellung (Anlage C). Der Senat der Leibniz-Gemeinschaft verabschiedete am 28. November 2013 auf dieser Grundlage die vorliegende Stellungnahme. Der Senat dankt den Mitgliedern der Bewertungsgruppe und des Senatsausschusses Evaluierung für ihre Arbeit.

1. Beurteilung und Empfehlungen

Der Senat schließt sich den Beurteilungen und Empfehlungen der Bewertungsgruppe an.

Das Zoologische Forschungsmuseum Alexander Koenig (ZFMK) unterhält wissenschaftliche Sammlungen, betreibt artbezogene Biodiversitätsforschung, insbesondere zur terrestrischen Fauna, und vermittelt seine Erkenntnisse in Fachwelt und Öffentlichkeit. Ende der 1990er Jahre hatte der Wissenschaftsrat den Forschungsmuseen in der Leibniz-Gemeinschaft eine wesentlich stärkere Forschungsorientierung empfohlen. Diese Empfehlung setzte das ZFMK außerordentlich erfolgreich um. Unter der Leitung des derzeitigen Direktors hat sich das ZFMK in den letzten Jahren von einem klassisch taxonomisch ausgerichteten Museum hin zu einer Einrichtung entwickelt, in der insbesondere die moderne phylogenetische Forschung eine zentrale Stellung einnimmt. Das Museum muss jetzt zu einem ausgewogenen Verhältnis von Forschungs- und Sammlungsarbeit gelangen.

Die **Forschungsleistung** des ZFMK entsteht in zwei Zentren, deren taxonomische, phylogenetische und molekularbiologisch-systematische Arbeiten international wahrgenommen werden. Das gründet auf einer sehr guten Publikationsleistung, insbesondere auf einem erfreulich hohen Anteil an referierten Veröffentlichungen. Die Forschungsleistungen des *Zentrums für Taxonomie und Evolutionsforschung* sind „sehr gut“. Das *Zentrum für Molekulare Biodiversitätsforschung* wurde empfehlungsgemäß nach der letzten Evaluierung aus einem bestehenden molekularbiologischen Labor aufgebaut. Damit wurde eine sehr leistungsfähige Einheit geschaffen, die innerhalb kurzer Zeit zu einem sichtbaren Alleinstellungsmerkmal des ZFMK geworden ist. Die Forschungsleistungen dieses Zentrums werden als „exzellent“ bewertet.

¹ Ausführungsvereinbarung zum GWK-Abkommen über die gemeinsame Förderung der Mitgliedseinrichtungen der Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz e.V.

Die **Sammlungen** des ZFMK, die im *Zentrum für Taxonomie und Evolutionsforschung* betreut werden, sind in einem sehr guten Zustand. Einige von ihnen sind von hohem wissenschaftlichem und wissenschaftshistorischem Wert. Vor diesem Hintergrund muss das Museum eine deutlich bessere Verfügbarkeit der Sammlungen für die Wissenschaft erreichen. So ist es notwendig, die Digitalisierung der Bestände mit Nachdruck voranzutreiben. Die Fortschritte bei dieser umfassenden Aufgabe sind gering. Auch sollte das ZFMK sein Engagement in internationalen Projekten zur Weiterentwicklung wissenschaftlicher Sammlungen erheblich ausweiten.

Der Senat begrüßt, dass der **Wissenstransfer** am ZFMK mit der Gründung des *Zentrums für Öffentlichkeitsarbeit und Ausstellungen* gestärkt wurde. Museumsschule und Besucherdienst erbringen überzeugende, wichtige Leistungen im Bildungsbereich. Es wird erwartet, dass der Ausstellungsbereich aufgrund der inzwischen verbesserten personellen Ausstattung nun eine größere Dynamik entwickelt und insbesondere die seit Jahren im Umbau befindliche Dauerausstellung zügig fertiggestellt wird. Das ZFMK sollte wesentlich höhere Besucherzahlen erreichen.

Das ZFMK ist seit dem 1. Januar 2013 rechtlich selbstständig. Damit ist jetzt die eigenverantwortliche **Steuerung des Museums** durch Leitung, Beirat und (das noch zu bildende) Aufsichtsgremium möglich. Das ZFMK muss nun eine Satzung erhalten. Der Senat bittet, ihm diese bis spätestens 1. Juli 2014 vorzulegen. In der Satzung müssen die Kernaufgaben des Forschungsmuseums (Sammlung, Forschung, öffentliche Bildung, Ausstellung) festgelegt und in ein angemessenes Verhältnis zueinander gesetzt werden.

Das ZFMK verfügt über eine angemessene **institutionelle Förderung**. Der Senat begrüßt die Klarstellung der Geldgeber, dass die Erträge aus Eintrittsgeldern nicht zuwendungsmindernd wirken. In den vergangenen Jahren hat das Museum umfangreiche Investitionsmittel erhalten, die es unter anderem zum Aufbau des *Zentrums für Molekulare Biodiversitätsforschung* nutzte, dessen Laborausstattung exzellent ist. Es besteht allerdings großer Platzmangel. Der Senat begrüßt es deshalb sehr, dass die Geldgeber die Raumsituation verbessern werden. Erst nachdem die interne Mittelallokation entsprechend den satzungsmäßig definierten Kernaufgaben des Forschungsmuseums gestaltet wurde, kann überblickt werden, ob zusätzliche Mittel für die im Bewertungsbericht empfohlene Konsolidierung der bestehenden Zentren und Sammlungen erforderlich sind. Die vorliegenden, mit hohem Finanzbedarf einhergehenden Ausbauplanungen sind nicht hinreichend in den strategischen Gesamtrahmen des Museums eingebettet und sollen derzeit nicht weiterverfolgt werden. Die Höhe der **Drittmittelträge** ist angemessen, wobei das ZFMK bei der Einwerbung von DFG-Mitteln besonders erfolgreich ist.

Der **Wissenschaftliche Beirat** begleitet das ZFMK kritisch und konstruktiv, aber nicht intensiv genug. Der Beirat muss enger in die strategische Entwicklung des ZFMK einbezogen werden. Es ist notwendig, dass er mindestens ein Mal im Jahr zusammentritt und zwischen zwei Evaluierungen ein Audit durchführt.

Der Direktor und der Stellvertretende Direktor des ZFMK sind gemeinsam mit der Universität Bonn berufen. Zahlreiche weitere Wissenschaftlerinnen und Wissenschaftler beteiligen sich an der universitären Lehre. Das ZFMK ist national und international gut vernetzt und beteiligt sich an wichtigen Großprojekten. Sehr begrüßt wird auch die **Kooperation** mit den Forschungsmuseen der Leibniz-Gemeinschaft sowie mit anderen naturkundlichen Museen und Sammlungen.

Der **wissenschaftliche Nachwuchs** wird am ZFMK gut betreut. Das Museum hat im Wettbewerbsverfahren der Leibniz Gemeinschaft eine Graduiertenschule eingeworben, die im April 2013 ihre Arbeit aufgenommen hat.

Bei der **Gleichstellung der Geschlechter** besteht am ZFMK erheblicher Nachholbedarf, da Frauen auf allen wissenschaftlichen Hierarchieebenen unterrepräsentiert sind. Dies ist angesichts des hohen Frauenanteils unter Studierenden und Promovierenden in der Biologie nicht nachvollziehbar. Das Defizit fällt insbesondere auf der wissenschaftlichen Leitungsebene und im Sammlungsbereich auf. Das ZFMK muss für die Zukunft unter Berücksichtigung des verpflichtend eingeführten Kaskadenmodells zeitgemäße Ziele, Zeithorizonte für deren Erreichung und Maßnahmen zur Umsetzung definieren, um eine bessere Geschlechtergerechtigkeit und Familienfreundlichkeit am Institut zu erreichen.

Das ZFMK hat sich in den vergangenen Jahren durch Neuzugänge wissenschaftlich sehr gut verstärkt. Es gilt nun, die Forschungsorientierung des **Personals** zu unterstützen und gleichzeitig erbrachte Leistungen im Bereich der Sammlungen zu honorieren. Um die Serviceleistungen im Bereich der Sammlungen zu verbessern, sollte das ZFMK insbesondere auch in das technische Personal investieren. Es wird empfohlen, an der internen Kommunikation zu arbeiten und die Beschäftigten zukünftig in wichtige strategische Entscheidungsprozesse besser einzubinden. Der Senat begrüßt, dass das Land vorsieht, den Stellenplan ab dem Jahr 2014 zu flexibilisieren.

Das ZFMK erfüllt die Anforderungen, die an eine Einrichtung von überregionaler Bedeutung und gesamtstaatlichem wissenschaftspolitischem Interesse zu stellen sind. Es leistet wichtige und sehr spezifische Forschungs-, Sammlungs- und Bildungsarbeit, die in dieser Form von einer Hochschule nicht erbracht werden kann. Eine Eingliederung des Museums in eine Hochschule wird daher nicht empfohlen.

2. Zur Stellungnahme des ZFMK

Der Senat begrüßt, dass das ZFMK begonnen hat, sich intensiv mit den Hinweisen und Empfehlungen aus dem Bewertungsbericht auseinanderzusetzen. Dieser Prozess sollte in Zusammenarbeit mit den Gremien fortgesetzt werden.

3. Förderempfehlung

Der Senat der Leibniz-Gemeinschaft empfiehlt Bund und Ländern, das ZFMK als Einrichtung der Forschung und der wissenschaftlichen Infrastruktur auf der Grundlage der Ausführungsvereinbarung WGL weiter zu fördern.

Annex A: Status Report

Zoological Research Museum Alexander Koenig - Leibniz Institute for Animal Biodiversity (ZFMK) Bonn

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1. Structure and tasks

Development and Funding

ZFMK was founded as the private zoological museum of the ornithologist and collector Dr. Alexander Koenig in 1900. Since 1934, it has had the status of an independent research institute. ZFMK was evaluated for the first time by the *Wissenschaftsrat* (German Science Council) in 1985 and was confirmed as a member institute of the *Blaue Liste* (the predecessor organisation of the Leibniz Association). In 2006/2007, ZFMK was evaluated by the Senate of the Leibniz Association which recommended a positive assessment of its funding eligibility to the funding bodies (Federal and *Länder* Governments).

Responsible department in the *Land* hosting ZFMK: Ministry of Innovation, Science and Research of North Rhine-Westphalia

Responsible department at Federal level: Federal Ministry of Education and Research

Legal form and organisation

Until December 2012, ZFMK was a subordinate agency of the Ministry of Innovation, Science and Research of North Rhine-Westphalia. Since January 2013, it has become an independent foundation under public law.

With the transformation of ZFMK into a public law foundation, the institute will acquire a supervisory body, the Foundation Board. The Board will consist of up to eleven members, including representatives of the responsible Federal and *Land* ministry, the University of Bonn, and the Scientific Advisory Board.

ZFMK's Scientific Advisory Board (SAB) is composed of five or six scientists from Germany and abroad with special expertise in species-based biodiversity research. At least one of the members is a professor at the University of Bonn. Members are proposed by the ZFMK Directorate and will be appointed by the Foundation Board in the future. They serve for five years. SAB carries out a regular evaluation of the institute every two years, including an onsite visit of two or three days. The bylaws relating to SAB will have to be adapted to conform to the new legal status of the institute.

The Directorate is composed of the scientific director, two vice directors (the head of administration and the head of the Centre for Molecular Biodiversity Research) as well as the heads of the other departments (seven members in total).

Every four weeks, the Conference of Principal Investigators meets to discuss research developments at the institute. The administrative vice director, the head of the IT group, and, on occasion, the leaders of larger research projects are involved as well as representatives of the doctoral candidates and the technical staff.

The Staff Council has legal status defined by a law of the *Land* North Rhine-Westphalia. Its task is to represent the interests of the employees. If necessary, meetings of the entire staff take place, as occurred recently in connection with ZFMK's change of legal status.

Mission and research structure

ZFMK is a natural history research museum carrying out documentation, research, and interpretation of biodiversity. Its comprehensive scientific collections focus on terrestrial vertebrates and insects. Research mainly concentrates on extant terrestrial and freshwater fauna. Tropical species-rich habitats, especially in Africa, but also on other continents are of major interest to the institute. The indispensable basis for all research is taxonomic knowledge with the corresponding infrastructures, collections and libraries. Taxonomy and new molecular methods are applied in supra-regional networks for ecological or evolutionary research. The exhibition halls and public events offer opportunities for knowledge transfer to the general public.

ZFMK is structured into three centres:

- *Centre for Taxonomy and Evolution Research*
- *Centre for Molecular Biodiversity Research*
- *Centre for Public Relations and Exhibitions*

The additional central units are the maintenance team, workshops, an animal keeping facility, the central libraries, and an IT group (see Appendix 1).

The three centres' activities are assigned to one or more of the following seven programmes which not only provide a thematic structure but also serve as instruments for the allocation of financial resources. All departments and sections of the institute are involved in these programmes, linking them in various ways.

Programmes 1 and 2 “Field research and collection-based research” are the basis for all biodiversity research projects (field-work and ecological studies including experimental and evolutionary research; taxonomic studies, morphological studies, digitisation projects and research on the history of biology). These programmes focus on revising taxa and describing species, carrying out regional inventories for specific projects, and keeping vouchers in the collections. Most projects in Programmes 1 and 2 have strong links to Programme 3.

Programme 3 “Molecular biodiversity research” (DNA-taxonomy, molecular phylogeny, molecular evolution etc.) has become a core element of many research projects, as nearly all taxonomic, biogeographic and evolutionary projects have molecular components. This was made possible by the establishment of the new Centre for Molecular Biodiversity Research (ZMB).

Programme 4 “Tropical biodiversity research” (ecology and distribution of tropical species, inventorying, monitoring and conservation of tropical biodiversity, capacity building in tropical countries) was developed to promote the application of taxonomic knowledge, especially in tropical, species-rich habitats.

Programme 5 “Free research themes” (mostly innovations, experimental research, development of new techniques and workflows) is open to new, experimental and possibly risky projects that might yield methods or workflows relevant to other programmes. Most of these studies aim at the development of new algorithms required for Programme 3.

Programme 6 “Service for science” (congresses, publications, reviews, teaching, loan service, maintenance of databases, archives and special libraries, organisation of research networks) provides researchers from in- and outside ZFMK with technical equipment and infrastructures like labs, databases, molecular laboratories, biobanks etc.

Programme 7 “Service for the public” is in charge of service for the media, support for the *Alexander Koenig Gesellschaft*, museum education, exhibitions, public relations and other forms of knowledge transfer to the public.

National and international scientific environment

In Germany, there are two larger institutions that, like ZFMK, are museums as well as natural history research institutes. They are located in Berlin (*Museum für Naturkunde* – Leibniz Institute for Research on Evolution and Biodiversity at Humboldt-Universität zu Berlin) and in Frankfurt (Senckenberg Research Institute and Natural History Museum as a member of Senckenberg Gesellschaft für Naturforschung with six research institutes and three natural history museums). ZFMK assigns itself to the medium-sized institutes in Germany which include Stuttgart State Museum of Natural History and the Bavarian State Collections in Munich.

ZFMK states that, taken together, the number of scientists and collection specimens at these five museums is comparable to the size of the Natural History Museum in London or the Smithsonian Institution in Washington. ZFMK sees its specific profile in the institute’s strong focus on terrestrial zoology and its methodological repertoire (especially with the *Centre for Molecular Biodiversity Research*).

National interest and justification for funding as a non-university institution

ZFMK collections are part of the national natural and cultural heritage. They comprise specimens from all over the world and are used for research by the German and international scientific communities. Furthermore, the institute plays an important role in the organisation and implementation of supra-regional research networks.

According to ZFMK, the long-term storage and availability of collections, biobanks, and biodiversity databases for research cannot be guaranteed by universities. Furthermore, ZFMK maintains that German universities have lost nearly all their expertise in taxonomy and associated areas. Thus, it is the task of natural history museums to preserve and provide species-based information and to develop innovative methodologies and applications for species-based biodiversity research. Finally, universities usually cannot provide the storage needed for large collections, and they have neither the space nor the staff to produce and show large exhibitions.

2. General concept and profile

Development of the institution since the last evaluation

Since the last evaluation (2006/2007), ZFMK has initiated a transformation process with the intention of making taxonomy the basis for applications in ecology, conservation biology and industry. Its objective is to become a leading institute for molecular biodiversity research and to be able to react flexibly to new research opportunities and challenges. According to ZFMK, taxonomy will remain its indispensable basis, but foundations for additional research units have had to be laid in order to bridge the gap between basic research and its applications.

Since 2006, the number of ZFMK researchers has grown thanks to a regular budget increase under the “Joint Initiative for Research and Innovation”. Employing new staff, however, was only possible on the basis of a new cooperation agreement with the University of Bonn as ZFMK’s staff appointment scheme was not sufficiently flexible.

As transcriptomic data has become more and more important, the demand for data processing has grown considerably. As a result, ZFMK invested significantly in computer systems and doubled the number of technicians in the IT service group (now four staff).

According to ZFMK, the most important improvement was the founding of the Centre for Molecular Biodiversity Research following a recommendation made at the last evaluation. This measure entailed restructuring the institute, which until then had focused mostly on taxonomy and systematics. Although the staff at this centre were only appointed recently, it is already involved in several projects like *1kite* (1000 insect transcriptomes), GBOL (German Barcode of Life) and the recently completed Strepsiptera-Genome project.

For the design and construction of exhibitions, ZFMK implemented a new exhibition group, including two scientists. The traditional cabinets crammed with mounted specimens had already been replaced earlier by displays showing habitats and animal communities, enriched with (often electronic) interactive elements.

In 2007, a new entomology building was inaugurated as a replacement for the “Montagehaus” that had to be demolished. It contains improved offices and collection rooms, but already lacks sufficient capacity for ZFMK’s increased needs, especially for the molecular laboratories of the new Centre for Molecular Biodiversity Research. Further improvements include the renovation of the main building’s south wing and the creation of two new studios in the north wing, one for the exhibition group, and one for the taxidermists. A new collection room was equipped for precious and large mammal specimens.

Results

In the last three years (2009 – 2012), the number of articles in peer-reviewed journals published by ZFMK employees has increased, as has the total number of publications and the number of annual publications per scientific full-time equivalent (see Appendix 2 for details).

ZFMK emphasises that research results are always published in English and, if possible, in open-access journals. New software developed at the institute is offered for free on its website. Moreover, open publication of research data is common practice at ZFMK, corresponding to the standards in molecular biology. For this purpose, established international databases, like GenBank or BOLD, are used.

For the period 2009 to 2012, ZFMK lists 19 conferences, symposia, and meetings that were either organised or attended by ZFMK researchers. Furthermore, four temporary exhibitions were presented in addition to the permanent exhibition “*Our blue planet – the living network*”.

Following the programme structure, the main results and outcomes in research, service and infrastructure can be summarised as follows:

Programmes 1 and 2 “Field research and collection-based research”

Between 2006 and 2011, many new species of animal have been discovered and described. The collections are continuously being adapted to the most recent valid classifications; vouchers and type material are continuously being integrated in the collections. According to ZFMK, inventories, descriptions and elaboration of determination keys are the foundations of all biodiversity research into species.

Research results achieved in Programme 3 “Molecular biodiversity research” comprise methods and findings in the fields of rapid biodiversity assessment, genomics, phylogenetics and molecular evolution.

Among others, results of Programme 4 “Tropical biodiversity research” include the coordination of the BIOTA East research network with scientists from Germany, Kenya and Uganda using a multi-disciplinary approach, the publication of a biodiversity atlas for the Kakamega Forest in Kenya and the discovery of several new mammal species in tropical Africa. Other projects, for example in Programmes 1 and 3, also address elements of tropical research.

Results of Programme 5 “Free research themes” are mainly achievements in bioinformatics (development of software, analyses of sequence data, barcoding).

Research-based outcomes of Programme 6 “Service for science” include the provision of science-based services and infrastructures mainly for research based on collections, counselling and mentoring, research management and networking, knowledge sharing and teaching.

Outcomes of Programme 7 “Service for the public” include services for the public and government agencies such as the loan of specimens, access to archives, participation in and organisation of public events, provision of biological information for agencies and citizens, support for policy makers as well as knowledge transfer for the public and for schools.

Strategic work planning for the next few years

In addition to specific goals for its seven programmes, ZFMK has defined a general vision for the future of the institute: By adding a new *Centre for Applied Species Diversity Research* to the centres already existing, it intends to become the *Leibniz Institute for Species Diversity Research* in order to bridge the gap between pure taxonomy and applications. Based on a variety of technologies, ZFMK intends to develop workflows for long-term monitoring of species diversity as well as inventorying and assessments of dispersal chances, e.g. in cooperation with national parks in tropical countries. By doing so, the focus, according to ZFMK, will lie on the study of biodiversity at species level, not only for a few indicator species, but for diversity in its entirety.

In order to realise this vision, ZFMK envisages a new building for the *Centre for Molecular Biodiversity Research* also providing space for the biobank, the central library (including the Biohistoricum), and for the Ichthyology Section. As a result, ZFMK could eliminate other spatial bottlenecks and use free rooms in the rented “Sonnenvilla” for the planned *Centre for Applied Species Diversity Research*.

For the staffing of this planned centre, the institute intends to recruit three additional professors (one W3 and two W2) as well as ten further scientific and technical staff. The new *Centre for Applied Species Diversity Research* is scheduled to have two departments, one for *Spatial Biodiversity Analyses* (including units for tropical ecology, geoinformation science [GIS], ecological statistics, and niche and dispersal modelling) and one for *Conservation Genetics* (including units for population genetics, microevolution, autoecology and environmental genomics).

Appropriateness of facilities, equipment and staffing

In the period 2009 to 2011, ZFMK's institutional funding increased from 4.46 m to 5.37 m €. The share of additional funding from third parties increased during this time as well (2009: 15%, 2010: 18%, 2011: 21%). In 2011, ZFMK's total revenue was approx. 8.5 m € (see Appendix 3 for details).

The joint institutional funding by the Federal and *Länder* Governments covers research and academic services according to the Implementation Agreement (AV-WGL) of the funding bodies and is the subject matter of the evaluation. As a museum, ZFMK receives further institutional funding, e.g. from the *Land* North Rhine-Westphalia. It has an income from entrance fees and donations and it receives additional funding for building operations (e.g. from the Federal Government).

According to ZFMK, at present, the institute is in a much better position than it was seven years ago. Since 2006, the institute has received special investment funds amounting to approx. 13.7 m € for renovation, equipment and rent of additional space.

With regard to personnel, ZFMK has been able to reinforce the IT group, the administration, the Exhibition Department (which did not exist at all) and the scientific staff. However, the Arthropod and the Exhibition Departments are still considered small in relation to the volume of work to be undertaken. ZFMK states that it lacks staff for the histology lab and a science-oriented director for the library. Moreover, ZFMK notes that it is short of staff in the *Centre for Taxonomy and Evolutionary Research* and the *Centre for Molecular Biodiversity Research*. It estimates that additional annual costs of approx. 1 m € would be needed to cover staffing requirements. Another hindrance to flexible staff management is ZFMK's still binding staff appointment scheme.

The institute emphasizes that its vision for reinforcement of applied biodiversity research implies a need for further resources, as already mentioned above. In accordance with its Scientific Advisory Board, ZFMK has applied for an additional 29.5 m € in its 2014 budget proposal to finance the planned new building and its initial equipment. The government of North Rhine-Westphalia has acknowledged that ZFMK needs at least an additional 4,070 square metres for the *Centre for Molecular Biodiversity Research*. The only suitable site near the museum was bought by an investor who is now offering to erect the building and to let it for 1.79 m € per year. At present, ZFMK is waiting for government approval allowing the investor to begin.

Furthermore, ZFMK states that it has insufficient financial resources for new permanent or special exhibitions or for the restoration of the existing exhibitions. The Vivarium is considered to be in need of reorganisation. Further expenses will be incurred for construction and renovation work on the animal house and the greenhouse as well as some of the windows in the historic main building. The one-off investments required to meet these needs are estimated to total 2.3 m €.

According to ZFMK, its IT infrastructure has been continuously improved, but the process of modernisation has not yet been completed. Respective costs for the next three years are estimated to total 500,000 €.

The ZFMK library is composed of a central library, special taxonomic libraries and the Biohistoricum. According to the institute, several shortcomings should be corrected: As there is no scientific director, a development strategy is not in place. In addition, access to digital media is limited. It estimates that annual costs of 360,000 € would be required for staffing and library purposes.

3. Centres and departments of ZFMK

Centre for Taxonomy and Evolutionary Research: Arthropods Department (11.65 FTE¹)

This department is responsible for the collections of invertebrates, which consist mainly of arthropods. At present, it has six curators. Traditionally, the position for biodiversity informatics has also been assigned to this department because the arthropod collections are the largest and their digitalisation is especially challenging. Every collection has a technical assistant. There is an additional 0.5 position for a technician in the beetle collection.

Work programme development

The main developments include:

- extension of the spectrum of methodologies (molecular phylogeny and DNA taxonomy/ barcoding)
- greater involvement in cross-cutting themes, like the inventory of German fauna, and development of methods for molecular phylogenetics and automated species discrimination
- improvement of the preservation status and accessibility of the collections
- increase in the number of publications per year, with more papers in higher-impact journals as well as increased external funding
- establishment of a new collection and section (Myriapoda)
- new appointments to the position for database programming and curator of the Hymenoptera collection
- reorganisation of part of the collections in new entomological cabinets, digitalisation of part of the collections
- commencement of replacing the collection database BIODAT with a more appropriate Diversity Workbench

Results

The research results since the last evaluation include contributions to Programmes 1 to 5 and findings in the fields of taxonomy, ecology and biogeography, evolution and morphology, rapid biodiversity assessment, molecular phylogenies and genomes, bioinformatics and history of biology. An important service carried out by this department is the provision of biodiversity information in digital form (database).

Work planning

The main strategic elements of research in the coming years include the improvement of the quality and speed of taxonomy, the improvement of evolutionary biology methods, the development of ecological niche and distribution modelling and the development of rapid diversity assessment tools. The medium term work foci comprise old and new objectives.

The following activities are seen as having particular, innovative potential: analyses of genome evolution, extension of the barcoding approach, integration of taxonomical and methodological expertise in tropical research, development and use of new markers in phylogeny based on

¹ Full time equivalents in 2012

known phylogenomic data, stronger networking and development of synergies between the sections.

Appropriateness of facilities

For the Arthropods Department, the construction of the Naumann Building (2007) has meant a substantial improvement for the entomological collections. Nevertheless, lack of space remains a problem, according to ZFMK. There are no offices or working places for researchers and Ph.D. students employed in new projects and no suitable rooms for new positions that have been granted for the projects GBOL, BiNHum, and GfBio. Adequate space for the collections (including quarantine rooms for fresh material, space for labs and freezers) is missing as well.

Centre for Taxonomy and Evolutionary Research: Vertebrates Department (6.2 FTE)

Work programme development

The main developments include:

- large staff turnover
- introduction of molecular methods in many projects, implementation of “Diversity Workbench” (the new specimen database)
- introduction of species distribution modelling
- major improvement in research in the Ichthyology Section, focus on fish in East Asia and radiation in ancient lakes; all the offices, laboratories and collection rooms in the Ichthyology Section have been renovated and newly structured in the course of the general renovation
- the fish collections have been reinstalled, enlarged and documented in a digital file; most of the fish specimens have been transferred to new glass jars
- the library has also been improved
- significant improvement of the conditions in the Herpetology, Ornithology and Theriology Sections

Results

The results since the last evaluation include contributions to Programmes 1 to 5 and 7 and encompass findings in the fields of taxonomy, ecology and biogeography, evolution and morphology, rapid biodiversity assessment, phylogeny, tropical research, historical biology, counselling and services for governmental agencies.

Work planning

The main strategic elements of research in the coming years include the collections of species diversity, the further development of the vertebrate collections, the development of rapid assessment tools and of species distribution models as well as their application. The medium term work foci comprise old and new objectives.

The following activities are seen as having particular, innovative potential: niche modelling and bio-geographic analyses, design of tools to integrate phylogenetic and population genetic information into the modelling of species distributions as well as the development of new methods to characterise habitats with satellite data in order to measure connectivity patterns on a larger

scale, DNA barcoding for the analysis of organic traces found in stomachs to study food spectra in correlation with habitat quality.

Appropriateness of facilities and staffing

According to ZFMK, the laboratory and IT equipment of the Vertebrates Department are excellent in general. A digital X-ray machine produces a new quality in non-invasive anatomical studies, especially for the fish collection. Even though offices and collection rooms have been renovated and many improvements have taken place over the past six years, adequate space and conditions (e.g. climate control of collections rooms) for staff and collections remain a problem.

As far as staffing is concerned, the department envisages transferring one of the two curator positions for ornithology to the Herpetology Section. The four technical assistants are increasingly involved in maintenance, care, support and service functions at the cost of research. Finally, there is need for a technician specialised in collection care.

Centre for Molecular Biodiversity Research (10.8 FTE)

Work programme development

Most of the major research activities of this centre are new. They include molecular taxonomy and biobank use with special emphasis on the “German Barcode of Life” project (GBOL), phylogenetic analyses of molecular data, genomics and bioinformatics.

Results

The research results since the establishment of this new centre (beginning in 2009) mainly contribute to Programme 3 and include findings in the fields of molecular taxonomy, bioinformatics (development and test of computer programmes), molecular phylogenies and genomics. The activities also comprise service (e. g. provision of DNA barcode data free of charge) and counselling.

Work planning

According to ZFMK, the major tasks in molecular taxonomy and biobank development will include the development of the GBOL database, the development of methods that facilitate the analysis of mass samples, the development of an international competitive biobank as well as software development. As far as bioinformatics are concerned, ZFMK envisages a comprehensive list of tasks including the development of software and tools. The implementation of a *Computing Centre for Molecular Biodiversity* in cooperation with the University of Bonn is planned and would represent a major achievement. Other important tasks for the future include activities in phylogenetics and genomics.

Appropriateness of facilities

As far as infrastructures are concerned, ZFMK puts special emphasis on its new biobank which is used as a repository for tissue and DNA-samples by GBOL participants and other users. Due to lack of space, freezers with vouchers are scattered around in various places. The molecular laboratories have excellent laboratory equipment. Nevertheless, due to lack of space larger equipment (e.g. for robotics) could not be bought and some instruments are still missing. New workplaces for project staff have been provisionally established in the “Sonnenvilla”, in the

beetle house, and in the cellar of the main building. IT infrastructure is considered to be outstanding. The IT technical staff has been reinforced during the past three years (the number nearly doubled). Nevertheless, in view of the new challenges, the institute's computing capacity is still considered to be a bottleneck. A large proportion of projects are dependent on computing hours provided by other institutions.

As already stated in Chapter 2, ZFMK is in need of a new building, especially to host the Centre for Molecular Biodiversity Research, but also for other purposes.

Centre for Public Relations and Exhibitions (5 FTE)

Work programme development

The scientific activities of this centre are mainly the compilation of information required for exhibitions, press releases, and the preparation of holiday courses for school students. Major tasks over the past years have included:

- establishment of the centre's organisational structure and staffing
- completion of the "Arctic and Antarctic" and "Deserts" sections of the permanent exhibition
- more frequent changes of temporary exhibitions
- increased public outreach through cooperation with the Alexander Koenig Gesellschaft and improved fundraising as a result of this cooperation
- more activities for school classes and children

Results

The activities of this centre have mainly contributed to Programmes 6 and 7. The most important achievements include the continuous repair and completion of sections of the permanent exhibitions and the installation of loaned temporary exhibitions. During special exhibitions the number of visitors doubles. Additional activities included short exhibitions in public places in Bonn, the production of graphics for posters, banners and advertisements and the enlargement of the programmes for school classes. A "Museum School" was established and equipped as well as a holiday programme for school students and a youth programme. The dinosaur exhibition attracted 210,000 visitors in 2010 (compared with 90,000 to 120,000 visitors in normal years).

Furthermore, an education programme has been established (supported by schoolteachers) and various services have been rendered to government agencies and others.

Work planning

The major future tasks of the Exhibitions Department are the completion of the permanent exhibition and the renovation of the "Vivarium" (display with living animals) in cooperation with the Ichthyology Section. Also, the technical protection and surveillance of exhibits have to be improved.

Temporary and touring exhibitions are to be produced and multilingual audioguides should be developed. ZFMK intends to increase the visibility of its research through exhibitions. ZFMK's website will also be improved (visit <http://beta.zfmk.de> for the beta version).

The Public Relations Department envisages intensifying the involvement of scientists in the preparation of press releases, designing new educational programmes for new exhibitions and carrying out media campaigns together with other large natural history institutions in Germany.

Appropriateness of facilities

According to ZFMK, the institute's situation has improved substantially during the past six years due to the establishment of the new Exhibitions Department and the employment of additional staff members. However, remaining weak points include the lack of resources for guards in the exhibition halls (at weekends) and for exhibition-related repair work. Also, there is no engineer to develop technical devices for the exhibitions. Furthermore, ZFMK needs a technician for the construction of exhibits, a designer and two additional taxidermists.

The Public Relations Department does not have the personnel to run the telephone customer service for more than nine hours per week. For service in general and website content management an additional administrative position is needed. The staff in the Public Relations Department (including external school teachers) and trainees are crammed into three offices. Last but not least, safety measures to protect exhibits against vandalism and theft have to be improved, and the second floor has to be cleared in order to use it for enlarging the permanent exhibitions.

4. Collaboration and networking

Collaboration with universities

ZFMK is a contractual collaborative partner of the University of Bonn. The director and the vice director are professors at the University of Bonn with a teaching load of two contact hours per week during the semester. The other ZFMK scientists participate in teaching as well. ZFMK considers teaching to be an indispensable part of capacity-building. New professors will be selected by joint commissions. According to ZFMK, both partners benefit greatly from this cooperation. There is a lot of interaction, like the planning of joint projects (e.g. GBOL), the organisation of joint lecture series and symposia.

There are also individual collaborative projects, e.g. with Loja University (Universidad Técnica Particular de Loja, Ecuador) for capacity-building in the "Acceleration of Biodiversity Assessment Project".

Collaboration with other institutions in Germany and abroad

An important consideration in ZFMK's general cooperation strategy is the fact that most biodiversity information and methodological knowledge resides in industrialised countries, while biodiversity is richest in developing countries. As a result, ZFMK engages in larger international networks

Within Germany, ZFMK is part of several networks including DNFS, a group of all German natural history museums, the "Humboldt Ring", a group of large research museums, the Leibniz "Biodiversity Network", and the BION group, a network of institutions interested in biodiversity in the Bonn region.

The previously mentioned "German Barcode of Life" project is a network funded by the Federal Ministry of Education and Research and headed by ZFMK. The main partners are German research museums, some university institutes and another independent institute in the Leibniz

Association (DSMZ). The “Freshwater Diversity Identification for Europe” project was acquired under the Leibniz competitive procedure and is also carried out by a network. Moreover, ZFMK is involved in various projects funded by the German Research Foundation (DFG).

On an international level, ZFMK was or is a collaborative partner in various EU projects (CETAF, ECBOL, AMIBIO, “open up”), as well as in projects connecting the institute with museums and other partners in Ecuador, Kenya, Rwanda, China, the USA, Canada, Israel, Vietnam, Indonesia, Congo, Belgium, Morocco, Spain, Scotland, Austria, Japan, Italy, Panama, Greece, Brazil, the Netherlands, and Zambia.

Between 2009 and 2011, ZFMK hosted 122 scientific guests coming to Bonn from Germany and abroad (for longer than a week). In the same period, ZFMK researchers went on 193 research visits (lasting longer than a week) to other scientific institutions in Germany and abroad.

5. Staff development and promotion of junior researchers

Staff development and personnel structure

As of 30 June 2012, ZFMK employed 108 people (88.2 fulltime equivalents). Of the personnel employed for research and scientific services (43 fulltime equivalents including doctoral researchers), 31 % were funded by third-party funding and 64 % had fixed-term contracts. 13 out of 50 staff employed in this category were women (see appendix 4).

Several long-term members of staff retired during the reporting period. The vacancies could be filled with young scientists. This was made possible by a special cooperation agreement with the University of Bonn in addition to the ZFMK staff appointment scheme. As a consequence, the number of employees on fixed-term contracts has increased. Three more researchers will reach retirement age by 2015. According to ZFMK, personnel development will be a major task in the future.

Since the last evaluation, ZFMK has been able to increase its scientific staff, mainly for the establishment of the new *Centre for Molecular Biodiversity Research*, but also in the administration and the exhibitions team. It is considered a great success that it was possible to double the number of researchers.

Promotion of gender equality

According to ZFMK, the objectives of its gender equality strategy are:

- equal treatment of all staff at the institute and transparency in their selection
- to increase the percentage of women in all areas in which women are under-represented
- a balanced ratio between women and men
- to promote young female researchers in order to enhance their motivation and competitiveness
- to make it easier for young mothers to combine work and family

All appointment procedures are supported by the Gender Equality Officer and documented by the management. In appointment procedures for professors (conducted jointly with the University of Bonn), the number of applications from men and women, the reasons for withdrawal from procedures, invitations to lectures, listed positions and applications have to be recorded in order to allow comparisons between applicants and improve opportunities.

Researchers with families have the opportunity to sign agreements on working times appropriate to their needs.

To help talented female researchers, ZFMK established the “Margarethe Koenig Prize” (named after the founder’s wife who was also a researcher), consisting of a full researcher position (TVL 13) for one year. It is reserved for alumnae of the institute who have just completed their Ph.D.

Promotion of junior researchers

Since the last evaluation, four ZFMK scientists have completed their *Habilitation*. The former curator for Diptera accepted a professorship at Haifa University. At present, another two young researchers are preparing their *Habilitation*.

In 2012, ZFMK successfully participated in the Leibniz competitive procedure and was granted a graduate school in cooperation with the Universities of Bonn and Münster. Its programme has a strong interdisciplinary approach involving systematic biology and bioinformatics.

Between 2009 and 2011, 25 doctoral degrees were completed by candidates who were employed at the institute or supervised by ZFMK researchers.

ZFMK scientists offer special courses, mainly for advanced students, at the institute. Students also have the opportunity to work in ZFMK laboratories and collections. Compact courses usually consist of lectures, practical exercises and seminars. Many Ph.D. students are recruited from participants in advanced zoology or molecular phylogeny courses. Training components include training in presentation techniques, advice on applications in support programmes and scholarships from various organisations.

Vocational training for non-academic staff

Since 2004, ZFMK has offered four apprenticeship training positions for the following non-scientific professions: management assistant in office communication, zoo-keeper, carpenter, and event manager. Since 2009, three apprenticeships have successfully been completed.

6. Quality assurance

Internal quality management

The rules of good scientific practice recommended by the DFG are observed by the institute and summarised in a handbook that is given to each new employee. ZFMK has nominated an ombudsman.

The institute uses administration software to document the institute’s products and activities. It includes an evaluation system for internal use which automatically generates personal points for each researcher. The entries are recorded by the researchers themselves and controlled for plausibility by the director. The number of points is generated according to the strategic goals of the Directorate; e. g. peer-reviewed publications get more points than others. Researchers with good scores have better chances of receiving new equipment or support for travel from the institute. The relevant decisions are taken by the director.

According to ZFMK, for many years the institute’s budget has not allowed any additional payments to employees. But as it has increased since 2006, the administration is currently drawing up regulations for annual gratifications for staff members in recognition of outstanding work.

Quality management by the Scientific Advisory Board

According to ZFMK, the institute's strategic planning, the quantity and quality of its publications, researchers' success in applying for grants, research results, and teaching activities are discussed personally with each researcher during the Scientific Advisory Board's biannual evaluation. This is also the occasion for the Directorate to discuss the strategic development of the institute and personnel issues. ZFMK intends to modify the Scientific Advisory Board's statutes because of the institute's new legal status. ZFMK notes that audits have not been possible to date as there was no Foundation Board.

Implementation of recommendations from the last external evaluation

The recommendations of the last evaluation (in italics) were considered by ZFMK as follows:

Research profile

1. *Define more precisely the Institute's profile (not just "terrestrial biodiversity research"). The research focus should be more specific and the Institute should develop a clearer profile, e.g. in combination with molecular methods.*

ZFMK developed a new concept for an "Institute for Species Diversity Research" that bridges the gap between basic research (taxonomy, evolutionary research) and applications for conservation biology, monitoring, ecology and sustainable use of biodiversity. Among others, during the past seven years, ZFMK has taken important steps in this direction mainly by establishing the *Centre for Molecular Biodiversity Research* and the recruitment of new staff (see Chapter2).

Research infrastructure

2. – 4. *The staff of the DNA laboratories should be reinforced with additional technicians and researchers. The expertise of curators should be involved. The profile of the DNA-laboratory requires a clearer focus. DNA-barcoding could be a more prominent task*

According to ZFMK, these recommendations have been implemented, mainly by establishing the *Centre for Molecular Biodiversity Research* but also by involving curators in phylogenetic and genomic studies. ZFMK points to its various barcoding projects.

5. *Stronger focus of collections on African fauna without, however, reducing research on Africa.*

ZFMK claims to have implemented this recommendation as its new curators mainly work on African species and strengthen the African focus of the collections. Also, the new rainforest exhibition (currently being developed) will show African fauna and flora, and the BIOTA East programme was carried out in Kenya and Uganda.

6. *The development of the tissue and DNA collection should be coordinated with other institutions.*

At present, the biobank is part of the German "DNA bank network" originally funded by the German Research Foundation, and is also a member of international networks like the GGBN.

7. -9. *Further development of the collection database BIODAT and cooperation with other museums; more investment in digitalization than in database programming; employment of a database manager.*

As BIODAT had to be discontinued, ZFMK started implementing its *Diversity Workbench* in 2011, which is now being used by several institutions in Germany. As recommended, ZFMK engaged its own programmer.

10. *The ornithology and ichthyology sections could (...) publish more and in better journals.*

According to ZFMK, research and publication activities as well as the acquisition of funds have improved significantly in the Ichthyology Section thanks to the appointment of a new senior researcher. As a new senior researcher has also recently been appointed to the Ornithology Department, ZFMK is optimistic that results will improve there, too.

11. – 13. *In the arthropod department the Hymenoptera, Lepidoptera and Coleoptera sections have to improve research activities and third-party funding of research projects. Work of the curator for Coleoptera is weak. The curator for Hymenoptera should spend less time on biodiversity informatics and focus more on research.*

ZFMK states that the situation changed completely in the Hymenoptera and Coleoptera Sections with the replacement of the former curators. A new position for biodiversity informatics has been established.

14. *Research on animal vocalizations is not convincing.*

The new head of this section (Theriology) specialises in taxonomy, zoogeography and conservation of small mammals in Africa. The bioacoustics lab is still being used, however, for the development of bio-acoustic monitoring techniques. This research is part of ZFMK's endeavour to speed up and automate biodiversity inventories, and is the topic of the EU-funded AMIBIO project.

15. *It would be desirable to design special exhibitions on the research of single ZFMK sections.*

In December 2012, a temporary exhibition dedicated to ZFMK's own research was completed.

Structure and organisation

16. *It is recommended to establish a Centre for Evolutionary Biology and Biodiversity Research together with the University. The chair for this centre should be selected in a joint appointment procedure.*

ZFMK states that it proposed the establishment of such a centre with components from several institutes. However, it has not been possible to establish it so far, partly because the University of Bonn did not have the means to finance a new chair. With the establishment of the *Centre for Molecular Biodiversity Research* and the appointment of a ZFMK researcher to the corresponding chair at the University of Bonn, the fields of evolutionary biology and biodiversity research have been reinforced nevertheless. Furthermore, the new MSc programme "Organismic Biology, Evolutionary Biology and Palaeontology" was established in close cooperation between ZFMK and the University of Bonn.

17. *In the event that the molecular laboratory is established as a separate research centre, there is the danger that this centre will not be well integrated with the work of other departments.*

ZFMK argues that there is a lot of interaction between the *Centre for Molecular Biodiversity Research* and the *Centre for Taxonomy and Evolutionary Biology* because of the molecular researcher's taxonomic interests and also because many projects require close collaboration between taxonomists and molecular biologists.

18. *It is not recommended to create a position for bioinformatics. Needs should be covered with co-operations.*

ZFMK argues that the relation between the efforts required for data production and the need for data analyses has changed radically. Due to new sequencing technologies and cheap laboratory services offered by commercial companies, there is a growing flood of molecular sequence data. For the institute, the real challenge is to develop workflows and tools for the analysis of these data. Under the Leibniz competitive procedure, ZFMK was granted funds for two computer scientists for three years. Some software innovations developed at ZFMK are already known in the scientific community. ZFMK employs a scientific programmer and a physicist/mathematician and collaborates closely with computer scientists, e.g. at institutes in Leipzig and Heidelberg.

19. *The ZFMK needs a supervisory committee.*

Since January 2013 ZFMK has a Foundation Board as a consequence of its new legal status.

- 20a. *The Institute's equal opportunities commissioner should be elected only by female employees.*

This has been implemented.

- 20b. *The percentage of female staff members in leadership positions and PIs should be increased.*

ZFMK states that it has been active in following this recommendation and gives several examples of women's appointments. If two candidates are equally qualified, the female applicant is given preference.

21. *The Institute should be allowed to use its budget in a more flexible way.*

This has been implemented.

Staff and budget

22. *More active participation in EU-funded research is recommended.*

An experienced scientist has been charged with representing the institute in scientific consultations at EU level and giving advice to applicants. ZFMK currently participates in various EU projects.

23. *The Institute's high percentage of time and energy devoted to research (in relation to other museum activities) should be acknowledged. The responsibility on the federal gov-*

ernment should be transferred to the Federal German Ministry of Education and Research.

This recommendation has been followed.

Promotion of young researchers and teaching activities

24a. *The strong commitment by the ZFMK to teaching activities is productive, as it attracts many highly motivated students. Teaching should be restricted to advanced courses, however.*

This recommendation has been followed.

24b. *Agreements with the University are needed to provide ZFMK members better reliability with regard to teaching programmes.*

According to ZFMK, this was and is not a problem as the researchers are free to design their own courses and can decide how often and when these are offered. Only the institute's professors have a compulsory teaching assignment of two hours per week during the semester. All additional courses are offered voluntarily by ZFMK staff members.

25. *A further increase in teaching activities at the cost of the institute's research is not recommended.*

ZFMK states that the additional and voluntary workload for its researchers is relatively low. It is still necessary for training researchers who are needed for the projects. Also, many courses offered by ZFMK scientists are shared by several lecturers.

26. *The cooperation between museums and collections in Germany should be improved; the DNFS could be a suitable panel to achieve this.*

ZFMK's director has been active in DNFS (conference of directors of German natural history museums) and is currently its deputy speaker. A new group (*Humboldt Ring*) has been created. It has started to share database development (*Diversity Workbench*), agreed on hiring new curators only after prior consultations (to avoid duplications in specialisation) and organises major joint projects like GBOL.

Work results and response in the scientific community

27. *Some of the institute's sections have a substantial publication record, others could improve their output.*

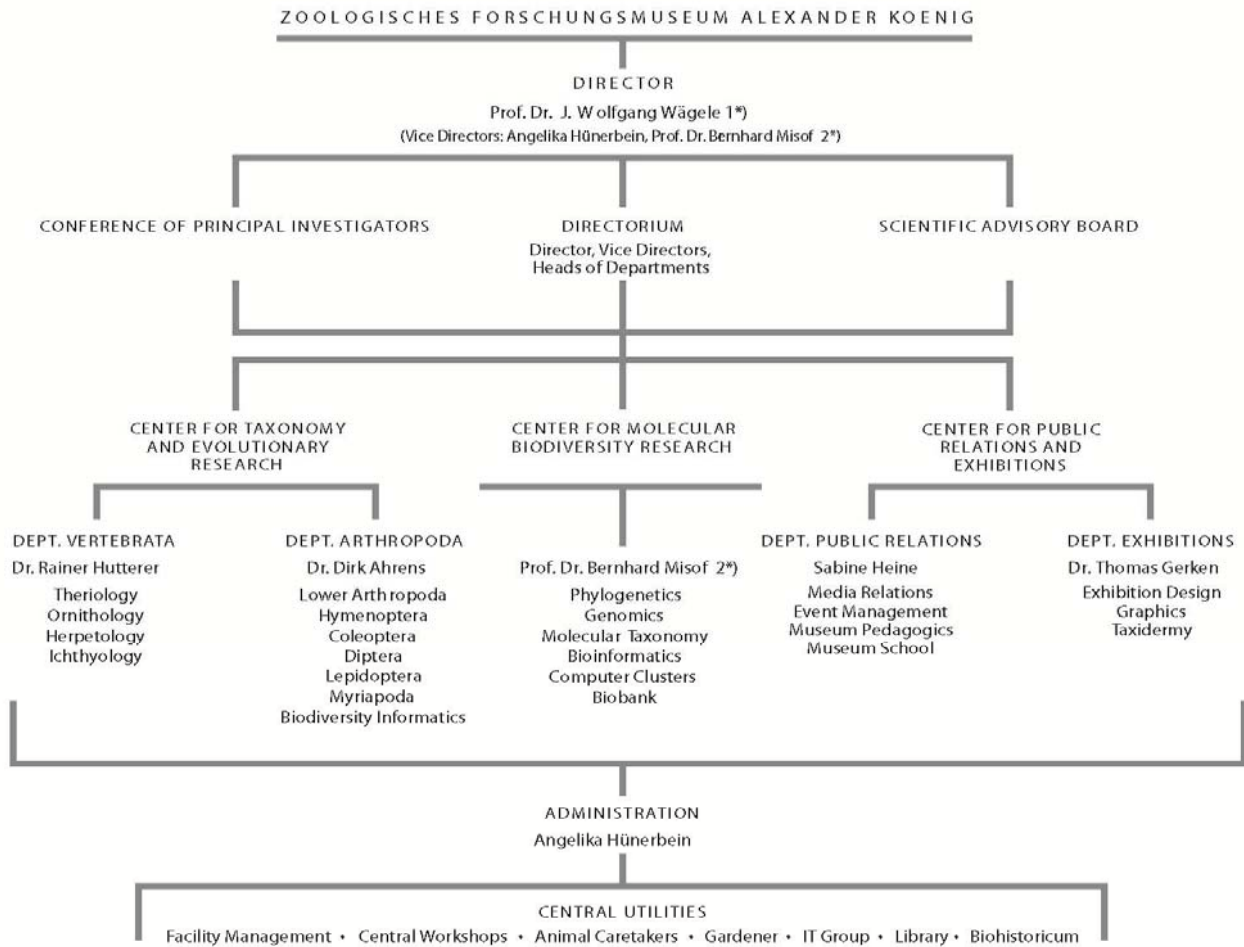
According to ZFMK this problem has vanished in all sections that are headed by new curators.

28. *It is proposed to reduce the number of printed products (journals of the museum) to only one to improve its quality and to reduce the workload of the editors.*

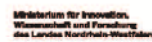
This recommendation has been followed: The series "Bonner Zoologische Beiträge" has been replaced by the "Bonn Zoological Bulletin" (BZB), published in English. The monograph series "Bonner zoologische Monographien" are now special editions of the BZB.

Appendix 1

Organisational Chart



1* simultaneously Chair for Systematic Zoology at the University of Bonn
2* simultaneously Chair for Molecular Biodiv. Reserach at the University of Bonn



Appendix 2

Publications and patents

	Period		
	2009	2010	2011
Total number of publications	123	147	186
Monographs	1	6	4
Individual contributions to edited volumes	13	8	15
Articles in peer-reviewed journals	89	110	131
Articles in other journals	18	23	36
Working and discussion papers	-	-	-
Editorship of edited volumes	2	-	-
Number of publications per full-time equivalent (FTE) in 'research and scientific services' (<i>excluding</i> doctoral candidates)	9.5	6.7	6.9
Number of publications per full-time equivalent (FTE) in 'research and scientific services' (<i>including</i> doctoral candidates)	3.2	2.1	2.8

Industrial property rights (2009 to 2011)	Granted	Registered
Patents	0	0
Other industrial property rights	0	0
Exploitation rights/licences (number)	0	

Appendix 3

Revenue and Expenditure

Revenue		2009			2010			2011 ¹⁾		
		K€	% ²⁾	% ³⁾	K€	% ²⁾	% ³⁾	K€	% ²⁾	% ³⁾
Total revenue (Sum of I., II. and III.; excluding DFG-fees)		6.895			7.548			8.444		
I.	Revenues (Sum of I.1., I.2. und I.3)	5.274	100		6.236	100		6.755	100	
1.	Institutional funding (excluding construction projects and acquisition of property)	4.455	84,46		5.125	82,17		5.367	79,46	
1.1	Institutional funding (excluding construction projects and acquisition of property) by Federal and <i>Länder</i> governments according to AV-WGL									
1.1.1	Proportion of these funds received through the Leibniz competitive procedure (SAW procedure)	165			41			0		
1.2	Institutional funding not received in accordance with AV-WGL									
2.	Revenue from project grants	816	15,48	100	1.107	17,76	100	1.386	20,51	100
2.1	DFG	516		63,24	794		71,73	605		43,65
2.2	Leibniz Association (competitive procedure) ⁴⁾							185		13,35
2.3	Federal, <i>Länder</i> governments	7		0,86	10		0,91	355		25,60
2.4	EU				75		6,76	16		1,16
2.5	Industry	22		2,7						
2.6	Foundations	19		2,31						
2.7	Other sponsors (<i>Alexander Koenig Gesellschaft</i> and <i>Brehm Fonds</i>)	253		30,89	228		20,60	225		16,24
3.	Revenue from services	3	0,06		4	0,07		2	0,03	
3.1	Revenue from commissioned work									
3.2	Revenue from publications	3			4			2		
3.3	Revenue from exploitation of intellectual property for which the institution holds industrial property rights									
3.4	Revenue from exploitation of intellectual property without industrial property rights									
II.	Miscellaneous revenue (e.g. membership fees, donations, rental income, funds drawn from reserves)	580			687			740		
III.	Revenue for construction projects (institutional funding by Federal and <i>Länder</i> governments, EU structural funds, etc.)	1.041			625			949		
Expenditures		K€			K€			K€		
Expenditures (excluding DFG fees)		6.895			7.548			8.444		
1.	Personnel	3.402			3.725			4.495		
2.	Material resources	1.768			1.728			2.114		
3.	Equipment investments and acquisitions	208			598			246		
4.	Construction projects, acquisition of property	1.041			625			949		
5.	"Reserves" (e.g. cash assets, unused funds)	476			623			640		
6.	Miscellaneous items	0			249			0		
DFG fees (if paid for the institution – 2.5% of revenue from institutional funding)		64.062,50			94.609,38			103.862,28		

¹ Preliminary data: yes/no

² Figures I.1, I.2 and I.3 add up to 100 %. The information requested here is thus the percentage of "Institutional funding (excluding construction projects and acquisition of property)" in relation to "Revenue from project grants" and "Revenue from services".

³ Figures I.2.1 to I.2.7 add up to 100 %. The information requested here is thus the percentage of the various sources of "Revenue from project grants".

⁴ Competitive procedure of the Leibniz Association: until 31 December 2010, funds allocated through this procedure were designated as institutional funding. Since 1 January 2011, the Leibniz Association has granted these funds as project grants.

Appendix 4

Staff financing

Basic financing and third-party funding / proportion of women (as of: 30.06.2012)

	Full time equivalents		Employees		Female employees	
	Total Number	on third- party funding Percent	Total Number	on temporary contracts Percent	Total Number	on temporary contracts Percent
Research and scientific services	42,90	30,65 %	50	64 %	13	61,54 %
Professors / Direct. (C4, W3 or equivalent)	2		2			
Professors / Direct. (C3, W2, A16 or equi.)						
Academic staff in executive positions (A15, A16, E15 or equivalent)	5		5		1	
Junior research group leaders / junior professors/ post-doctoral fellows (C1, W1, A14, E14 or equivalent)						
Scientists in non-executive positions (A13, A14, E13, E14 or equivalent)	27,23	31,1 5%	31	64,52%	9	55,65%
Doctoral candidates (A13, E13, E13/2 or equi.)	3,95	100%	6	100%	2	100%
Research Assistants	4,72	15,2 6%	6	100%	1	100%
Service positions	22,25	0,45 %	28			
Laboratory (E9 to E12, upper-mid-level service)			4			
Laboratory (E5 to E8, mid-level service)						
Animal care (E5 to E8, mid-level service)	1		1			
Workshops (E5 to E8, mid-level service)	2		2			
Library (from E13, senior service)						
Library (E9 to E12, upper-mid-level service)	1		1			
Library (E5 to E8, mid-level service)	1		1			
Information technology - IT (E9 to E12, upper-mid-level service)	3,5		4			
Technical (large equipment, service) (E5 to E9, mid-level service)	13,75	0,75%	15			
Administration	15,3		19			
Head of the administration	1		1			
Staff positions (from E13, senior service)						
Staff positions (E9 to E12, upper-mid-level service)						
Internal administration (financial administration, personell etc.) (from E 3 to E 8)	6,8		10			
Internal administration (financial administration, personell etc.) (E9 to E12, upper-mid-level service)	0,5		1			
Building service (E1 to E4)	7		7			
Student assistants	3,75	100 %	7			
Trainees	4		4			
Scholarship recipients at the institution	2	100 %	2		2	
Doctoral candidates						
Post-doctoral researchers	2	100%	2		2	

Annex B: Evaluation Report

Zoological Research Museum Alexander Koenig - Leibniz Institute for Animal Biodiversity (ZFMK) Bonn

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Appendix:

Members of review board and guests; Representatives of collaborative partners

1. Summary and main recommendations

ZFMK is one of the smaller natural history research museums in Germany. At the end of the 1990s, the Science Council (Wissenschaftsrat) recommended the research museums in the Leibniz Association to focus more on research and ZFMK implemented this recommendation extremely successfully. In the last few years, it has developed from a classic, taxonomically-based museum to a forward-looking biodiversity research institution. The new Centre for Molecular Biodiversity Research in particular is highly regarded internationally. The combination of classic taxonomy, molecular genetic methods and bioinformatics produces excellent research results. The research performance of the Centre for Taxonomy and Evolutionary Research is very good.

However, museum-related tasks have been conducted less intensively in the last few years. ZFMK's collections comprise seven million objects (especially vertebrates and invertebrates), some of them of great value both in terms of science and science history. The museum should ensure that its collections are much more visible and accessible to the scientific community. The Centre for Public Relations and Exhibitions does very good work, especially in the educational field with the museum school and visitor services. By contrast, not enough importance has been assigned to ZFMK's exhibition sector so far. Although there has been an increase in human resources, the sector is still unable to exploit its potential.

In the last few years, ZFMK's current director has sparked dynamic scientific developments. He has managed to recruit outstanding scientists for the museum. ZFMK presented further ideas and plans for scientific expansion, which, on principle, is a good thing. However, these ideas and plans have not yet been sufficiently interrelated in an overall strategy.

Overarching planning of this kind was made more difficult for the museum's Directorate by its lack of legal independence. Major progress was made when the *Land* North-Rhine Westphalia transformed it into an independent foundation under public law on 1 January 2013. This extended the direct responsibility of ZFMK's Directorate, the Scientific Advisory Board and the Foundation Board (as yet to be established) quite considerably. For the management of the museum this means great opportunities as well as challenges. Against this backdrop, the core points and recommendations contained in this evaluation report seek to clarify certain basic issues which now have to be addressed.

Particular attention should be paid to the following recommendations in the evaluation report (highlighted in **boldface** in the text):

General Concept

1. In January 2013, ZFMK became legally independent, a step which had long since been recommended. This development is greatly welcomed. ZFMK's Directorate and the Foundation Board, which is still to be established, are now faced with the task of defining the core tasks of the research museum (collections, research, public education, exhibitions) and, above all, determining an appropriate relationship between them in the framework of as yet unformulated statutes.

Internal funding will have to be allocated in proportion to this relationship. Subsequently, it will be necessary to examine to what extent specific additional funding is required, and how much, in order to achieve the recommended consolidation of the existing Centres and other tasks.

The Scientific Advisory Board should be significantly involved in resolving these central issues.

2. It is greatly welcomed that the funders are going to improve the space situation for the Centre for Molecular Biodiversity Research and some of the collections in the Vertebrates Department. The museum categorically needs the firmly scheduled new building which is at an advanced stage of planning.
3. The museum does not benefit from income from entrance fees. To motivate the museum to attract larger numbers of visitors it is recommended that this income should remain with the museum to promote the exhibition sector.
4. ZFMK's progress in digitalising its holdings is below standard. How much effort is actually put into digitalisation is essentially a question of the priorities set by the Directorate. Digitalisation is one of the core tasks of the scientific services provided by a research museum. It is therefore not satisfactory to finance it largely from third-party funding.

Staff development

5. With reference to gender equality ZFMK has a lot of catching up to do. Women are underrepresented on all levels of the scientific hierarchy, particularly among the lead scientists and curators. ZFMK is urgently recommended to increase the proportion of women and to align these efforts with the DFG's cascade model which the Leibniz Association also employs.

Quality Assurance

6. In accordance with standard practice at Leibniz institutions, it is recommended that the Scientific Advisory Board should meet at least once a year. It must also conduct an audit between two evaluations. This will make it easier to involve the Scientific Advisory Board more closely in ZFMK's strategic development.

2. General concept and profile

Development of the institution since the last evaluation

At ZFMK research plays a central role. The museum's extremely successful scientific development is due to the current director. Since assuming the position in 2004, he has significantly and very dynamically driven science at the museum. Today, ZFMK is internationally recognised for its taxonomic, phylogenetic and molecular biological/systematic work. After the previous evaluation, plans were implemented to develop the existing molecular lab into a Centre for Molecular Biodiversity Research. This created a very efficient unit which has become one of the museum's visible unique features in a very short time (see below for details of the individual units).

ZFMK's collections are maintained by the Centre for Taxonomy and Evolutionary Research. The collections mainly comprise vertebrates and arthropods in terrestrial and limnetic habitats. There are approximately seven million collection items divided up into ten sections. Some of ZFMK's collections are of great value both in terms of science and science history.

The museum's ten collection sections are each maintained by a scientific curator. In the last few years, there has been a change of generation amongst scientific curators. It is very positive that the newly appointed curators focus on research. Against this backdrop, the research performance of the Centre for Taxonomy and Evolutionary Research is now very good (see below).

One of the core tasks of research museums is to maintain and develop their collections as well as to make them visible and accessible to the research community (e.g. by digitalisation, see below). This is particularly true for type specimens which are used as reference for describing and naming species. The very successful scientific development of the museum so far has tied up

considerable resources. Tasks related to maintaining and developing the collections, although equally important for a research museum, have not been conducted so intensively in the last few years. This has to improve.

In January 2013, ZFMK became legally independent, a step which had long since been recommended. This development is greatly welcomed. ZFMK's Directorate and the Foundation Board, which is still to be established, are now faced with the task of defining the core tasks of the research museum (collections, research, public education, exhibitions) and, above all, determining an appropriate relationship between them in the framework of as yet unformulated statutes. The result should be in line with a white paper issued by the Joint Science Conference on the research museums in the Leibniz Association.

Internal funding will have to be allocated in proportion to this relationship. Subsequently, it will be necessary to examine to what extent specific additional funding is required, and how much, in order to achieve the recommended consolidation of the existing Centres and other tasks.

The Scientific Advisory Board should be significantly involved in resolving these central issues.

Strategic work planning for the next few years

At the evaluation, ZFMK presented plans for a new Centre for Applied Species Diversity Research. This Centre would utilise taxonomic knowledge ("species knowledge") for ecological applications. To implement this measure the museum foresees additional expenditure for materials and human resources (one W-3 professorship, two W-2 professorships, ten scientific and technical positions; see Status Report p, A-6)

Some experts consider it a good idea, but think the necessary elaboration is missing. They recommend grasping the opportunity to anchor this internationally pathbreaking theme in Germany and see Museum Koenig as the right location for it. The planned Centre's focus on applications is also in line with the mandate of a Leibniz institution to work at the interface with society.

By contrast, the majority of experts recommend not pursuing the project. Applied species ecology is a highly competitive field. Although the taxonomic element could be related to the museum's direction of work, the ecological element is not sufficiently developed in Bonn. It would be necessary to expand knowledge and human resources in order to be able to be internationally competitive in this field. The plans presented by the museum were not sufficiently convincing. Furthermore, during the evaluation visit it emerged that these new plans have neither been adequately anchored in the immediate academic environment (University of Bonn) nor in the museum itself.

In addition to the plans for the new Centre, the museum also presented further ideas for the development of the museum, partly involving high financial requirements (see Status Report, p. A-6 and below). They reflect the remarkable scientific dynamics at the institution. First of all, however, it is necessary to consolidate the two existing Centres (Centre for Molecular Biodiversity Research, Centre for Taxonomy and Evolutionary Research).

Museum Koenig has a Specialist Library for zoology with a research archive for the history of biology (Biohistoricum). The museum requires additional funding to continue developing this sector. However, the museum's arguments were not sufficiently convincing. ZFMK is, therefore,

recommended to make use of opportunities for collaborations with specialist information Centres and local libraries as well as those in the Leibniz Association. Existing staff would have to receive further training to meet the new requirements. One of the reasons the museum gives for the additional requirements for the library is the need to guarantee online access to specialist journals which, since becoming independent, is no longer provided by the university. As this is a problem faced by many Leibniz institutes it is recommended to seek a solution for the Leibniz Association as a whole.

ZFMK has a Vivarium that is supposed to be modernised. However, the practice of keeping live animals in museums has now become contentious. The tendency is to discontinue it and rather cooperate with zoos. Irrespective of this, the Vivarium is considered to be disproportionate in relation to the size and financial provisions of the museum. ZFMK is thus recommended not to pursue plans to modernise the Vivarium but to reconsider whether it should be maintained against the backdrop of modern exhibition concepts.

Given that the collections are currently not particularly visible, ZFMK and its committees should soon examine what role the collections should play in the future. The second step should be to elucidate the question of focus within the collections.

Appropriateness of facilities, equipment and staffing

In 2011, ZFMK's institutional funding was approximately 5.4 million EUR. In relation to this, the income from third party funding was appropriate (1.4 million EUR = 25%). ZFMK has been particularly successful in raising DFG funding (605 T€ = 44% of third-party funding). Including other income (e.g. from donations, contributions from the Alexander Koenig Society) and income from building measures the museum had a total budget of approximately 8.4 million EUR in 2011.

In the last few years, ZFMK has received considerable amounts of investment which it has used, amongst other things, to develop the Centre for Molecular Biodiversity Research (ZMB). The museum's lab equipment is excellent. However, there is a severe shortage of space. **It is greatly welcomed that the funders are going to improve the space situation for the Centre for Molecular Biodiversity Research and some of the collections in the Vertebrates Department. The museum categorically needs the firmly scheduled new building which is at an advanced stage of planning.**

In order to consolidate the existing scientific Centres as well as the collections a need is seen for additional funding. In view of the success of the Centre for Molecular Biodiversity, which should be secured, the IT infrastructure in this sector must be improved.

The collections are headed by scientific curators and maintained by technical staff/assistants. Doctoral candidates, students and volunteers also work in the collections. The museum has strengthened its scientific base very successfully by appointing new scientific staff. Appointments of technical staff have not kept pace. As a result, the personnel situation in this sector is fraught. However, collection-based research and collection maintenance are extremely dependent on well-qualified technical staff. Urgent measures are required (see Section 5 Staff) both to consolidate the personnel situation as well as for staff development. This will also improve the visibility of the collections and the extramural usage possibilities.

How great the needs will actually be must be decided by the Directorate, Scientific Advisory Board and Foundation Board once the recommended basic decisions on balancing the museum's various tasks have been taken.

The museum does not benefit from income from entrance fees. To motivate the museum to attract larger numbers of visitors it is recommended that this income should remain with the museum to promote the exhibition sector (possibly earmarked so that they are re-invested in the exhibition sector).

The management principles, which go back to 2003, are not in accordance with valid resolutions of the Federation and *Länder*. The revision being planned by the *Land* which hosts the museum is welcomed and should be conducted speedily.

Results

ZFMK's research is conducted in the Centre for Taxonomy and Evolutionary Research and the Centre for Molecular Biodiversity Research. The publication record is very good with a pleasingly high proportion of peer-reviewed publications. (See the evaluation of the Subdivisions for the individual research performance.)

The collections are in very good condition despite the fact that proportionately less time is spent on maintaining them. However, **ZFMK's progress in the digitalisation of its holdings is below standard**. Consequently, extramural usage possibilities are restricted and the number of loans is low in relation to the significance of the collections. The Directorate should establish the appropriate service idea in the institute and recognise work in this sector accordingly. The museum must ensure that its collections are much more accessible to the scientific community. **How much effort is actually put into digitalising holdings is essentially a question of the priorities set by the Directorate. Digitalisation is one of the core tasks of the scientific services provided by a research museum. It is therefore not satisfactory to finance it largely from third-party funding.**

The exhibitions are the responsibility of the Centre for Public Relations and Exhibitions. The exhibition concept is based on the faithful reproduction of collection objects (naturally-presented, large-scale landscape scenes). Due to its densely-populated catchment area, ZFMK has the potential to attract significantly larger numbers of visitors. By organising attractive special/temporary exhibitions it should try to increase them. In the education sector the museum does very good work. In 2011, a total of 719 museum learning activities (tours, workshops, public lectures) were offered, including a large number of events for groups of school students.

Staff at the museum participate in scientific self-governance and are engaged in (scientific) policy consultancy (Diversitas, CETAF, IPBED). This engagement is welcomed.

3. Subdivisions of ZFMK

The **Centre for Taxonomy and Evolutionary Research** conducts important museum-specific tasks such as the recording of biodiversity, the taxonomic description of new animal species and the classification of species in a phylogenetic system. The classic spectrum of taxonomic methods is meaningfully complemented by collaborations with the Centre for Molecular Biodiversity.

The Centre is divided into two departments, the Arthropods Department and the Vertebrates Department. In the last few years, both departments have been strengthened scientifically by the

appointment of new scientific staff. In most cases, it has been possible to employ recognised scientists. Such clever hires have been of great benefit to the museum's curatorial expertise. Each of the groups is very well respected, scientifically lively and vibrant and very competitive internationally. On principle, the ability and willingness to curate should be a requirement for hires in the Centre for Taxonomy and Evolutionary Research. In future, the Scientific Advisory Board should be involved in personnel decisions in the curatorial sector.

Within the collections, museum policy currently focusses on developing the Arthropods Department which has more third-party funding and more staff. But ZFMK's highlights tend to be in the Vertebrates Department which also has the better publication record. Thus, as described above, during a second stage, internal clarification of the future role of the collections should address the issue of focus (see Section 2 General concept).

The overall performance of the **Arthropods Department** is very good. The turnover in personnel has largely been completed. The scientific expertise within the group is complementary. However, it has only been working together for a short time and is thus recommended to start a team building process in order to decide jointly on the focus of the work programme and develop a publication/intellectual culture.

The group's publication output in peer-reviewed journals is very good, whereby the publications the newly-appointed staff brought with them also flowed into this assessment. Research performance benefits significantly from the group's good cooperation with the Centre for Molecular Biodiversity Research.

One special feature deserves particular mention: the millipede collection which has been greatly upgraded by the appointment of a very well qualified new curator (previously a postdoc at the Field Museum in Chicago). With 12,000 specimens it has the potential to become a unique feature for ZFMK within the German research museum landscape.

The overall performance of the **Vertebrates Department** is also very good. Here the turnover in personnel is still underway. So far, it has been possible to recruit three scientifically very well recognised curators (see also Section 5 Staff). One crucial task will be to find a suitable successor for the head of department who is reaching retirement age.

The group is highly respected in taxonomy and has produced impressive work in the field of speciation. They are recommended to work on a higher systematic level and to include meta-analyses. Efforts should also be made to increase work on the genetic basis of morphological variation. This will further strengthen links to the Centre for Molecular Biodiversity Research.

Generally, the group has published very well, especially in peer-reviewed journals. However, performance within the group is uneven. Impressive transregional monographs have been produced for different groups of organisms. With respect to comprehensive knowledge in taxonomy and phylogeny, the head of department, for example, has made impressive contributions to the six-volume handbook "The Mammals of Africa".

The Vertebrates Department maintains very important and valuable collections such as parts of the Brehm Collection that goes back to 1808 and marks the beginning of scientific ornithology. The collections are distributed over four different floors of the museum. It is therefore recommended to concentrate the location of the vertebrate collections appropriately once the new building, which is currently at an advanced planning stage, has been completed (see Section 2 General concept).

The **Centre for Molecular Biodiversity Research** developed from the museum's Molecular Laboratory in 2010. In this context it was possible to fill a number of new positions with recognised experts who head the sections on Molecular Taxonomy and Biobank, Phylogenetics, Genomics und Bioinformatics. They are supported by four technical assistants and an IT engineer. A renowned scientist was also hired to lead the group. This pooling of expertise in the field of systematics is unique in Germany and the combination of bioinformatics with biological expertise is world class.

Within a short time, the group has managed to produce very impressive results. Together with the Centre for Taxonomy and Evolutionary Research it has developed into a very strong integrating element within the museum. It contributes important expertise to museum-specific projects (DNA barcoding, speciation). Furthermore, the group plays an important role in coordinating larger research clusters (German DNA Bank Network, GBOL, FREDIE). With its biobank expertise the Centre is the most advanced group in Germany and has the potential to take on a leading role in developing the necessary national strategy for conservation (with additional funding). A great need for research has been identified in the field of DNA storage/dry storage, for example.

The Centre is excellent. It ensures the museum very high international visibility. In order to maintain this important new Centre with its entirety of expertise and exploit its potential for the future, its IT structure must be improved. Finding a solution to the space problem is an urgent task of overriding importance (see Section 2 General concept),

Centre for Public Relations and Exhibitions

The Public Relations section conducts good, important work with its museum school and visitor services. The museum participates in many different activities to promote itself as well as research on biodiversity. It has a place in the regional media and social media. It is highly welcomed that ZFMK's website is currently being re-designed.

The exhibition sector has not been a priority at the museum for a long time. It has been strengthened by the establishment of the Exhibitions Department only recently. In 2010, the leadership was appointed. Now there are two biologists who are responsible for the design and development of exhibitions. They are assisted by three technical staff (taxidermists) and a graphics designer. The improvement in the staffing situation will now have to spark new life in the exhibition sector because the permanent exhibition "Our Blue Planet – the living network" has been subject to reworking for years. This should finally be completed.

As the Scientific Advisory Board already pointed out, the museum's current research activities and results should be made more visible in the exhibitions. In order to become state of the art museologically, the museum should recruit external expertise and outsource certain tasks (art direction, graphics) in future. For the plans relating to the Vivarium, visitor numbers and facilities see also Section 2 General concept. For the planned rainforest exhibition targeted fundraising will be undertaken.

In relation to its means, the Centre for Public Relations and Exhibitions does very good work. Although staffing provisions have improved in the last few years, the Centre is still considered to be undersized and under-ambitious. The future role of the exhibition and education sector must also be concretised in the clarification process mentioned above (see 2 General concept).

4. Collaboration and networking

In terms of staffing Museum Koenig is closely linked to the University of Bonn (see also Section 5 Staff). The Director and Deputy Director are also professors at the university (Chair of Systematic Zoology, Professorship for Molecular Biodiversity Research). Many other scientists are involved in university teaching. This engagement in training junior researchers is very important for the museum. In the newly funded Leibniz Graduate School on Genomic Biodiversity Research the museum cooperates with institutes at the Universities of Bonn and Münster. The integration of expertise in bioinformatics from Münster is outstanding.

Networking with the research museums in the Leibniz Association as well as with other natural history museums and collections (e.g. in the cluster of German research museums, "Humboldt-Ring") is greatly welcomed. ZFMK is involved in the Leibniz "Biodiversity Network" and with other Leibniz institutions in the project, "Freshwater Diversity Identification for Europe" (FREDIE), for which it was granted funding under the SAW procedure (Leibniz Competition).

ZFMK is well connected both nationally and internationally. This is demonstrated, for example, by its participation in important major projects (such as GBOL, BIOTA-East, GBif-D). Staff at the museum conduct joint research projects for which they have raised funding with partners at universities and museums at home and abroad, like the 1K Insect Transcriptome Evolution project 1KITE for the analysis of 1,000 insect transcriptomes. Furthermore, ZFMK coordinated the DFG's Priority Programme "Deep Metazoan Phylogeny" (until 2010), which involved a large number of university and non-university partners. ZFMK's involvement in capacity building, for example in Ecuador and African countries, is explicitly welcomed.

It is however, regrettable that ZFMK is not involved in the EU-funded Integrated Activities Grant SYNTHESYS which aims to create a shared, high quality approach to the management, preservation, and access to European natural history collections.

5. Staff development and promotion of junior researchers

On 30 June 2012, 50 people were employed in the "Research and Scientific Services" sector at ZFMK. At 64%, the proportion of staff on fixed-term contracts was high for a museum. In addition, many volunteers also work at the museum.

In the last few years, a **major change of personnel** has taken place at ZFMK. The museum has strengthened its scientific base significantly by the appointment of new staff. The ability and willingness to curate should generally be a requirement for hires in the Centre for Taxonomy and Evolutionary Research. In future, the Scientific Advisory Board should be involved in personnel decisions in the curatorial sector.

Furthermore, as a result of the scientific development of the museum since the last evaluation, the number of staff has grown significantly (2005: 80 staff, 2012: 108). Some of the new staff who have been hired in the last few years could not be employed by the museum itself, so 25 museum staff are currently employed by the university. This state of affairs is untenable and should be stopped without delay. For its part, the *Land* plans to make the **staff appointment scheme** for 2014 more flexible. It is assumed that the contracts of the staff employed by the university will be altered by then, at the latest, so that they become employees of the museum.

The increase in personnel is not equally distributed amongst the occupational groups. Thus it is recommended to factor in more employees in the technical sector in future planning (see Section 2 General concept). The demands of work in the collection sector have changed radically (e.g.

DNA-barcoding as part of curation). In order to ensure the continuation of state of the art collection maintenance and development, **continuing education** for staff is particularly important. Participation in SYNTHESYS would mean the museum could benefit from EU-wide continuing education and exchange opportunities. A more flexible staff appointment scheme will also have a positive impact on the opportunities for personnel development.

Unfortunately, the long overdue transformation of the museum into a foundation under public law has caused insecurity amongst some members of staff. There were, for example, quite unfounded fears with regard to redundancies and accrued rights. Thus, in the immediate future, ZFMK should place particular emphasis on **communication** between management and staff. Especially in view of the development plans that have not been appropriately anchored within the institute (see Section 2 General concept) it is recommended to get people on board by integrating them in important strategic decision-making processes.

With reference to gender equality ZFMK has a lot of catching up to do. Women are underrepresented on all levels of the scientific hierarchy, particularly among the lead scientists and curators. The low representation of women is surprising given the fact that a high proportion of women study biology and do a dissertation in this field. **ZFMK is urgently recommended to increase the proportion of women and to align these efforts with the DFG's cascade model which the Leibniz Association also employs.** The gender equality and family-friendly policies are not state of the art and need to be updated and concretised, especially with regard to reconciling family and career. In order to improve the situation a systematic approach to filling vacancies is also required, such as identifying suitable female candidates and encouraging them to apply.

In order to promote young, female post-docs, ZFMK has created the Margarethe Koenig Prize: to help launch their careers, prize winners are granted a full research position for twelve months. It is seen as too restrictive that the prize is only awarded to the institute's own alumnae. To enhance its effectiveness, it is recommended to announce it internationally so that female postdocs from outside can be recruited to the institute.

For **junior researchers**, ZFMK is an attractive research location. They are very well supervised at the museum. Between 2009 and 2011, 25 doctorates were completed, whereas in mid-2012, only six doctoral candidates worked at the museum. Under the Leibniz Competition, ZFMK was granted funding for a Graduate School on Genomic Biodiversity Research which was launched in April 2013 (See 4. Cooperation).

The museum's engagement in **vocational training** is welcomed. In mid-2012, four apprentices were employed.

6. Quality Assurance

In January 2013, ZFMK became legally independent, a step which had long since been recommended (see 2. General concept). The administration is in a position to be efficient and service-oriented. It will be well able to carry out its future role of administering the museum independently. It is welcomed that a clear delegation framework has been laid down in writing. Programme management and funding allocation is conducted in three Centres via seven programmes which are partly identical with the institute's overarching interdisciplinary areas. ZFMK is expected to develop a reporting system of appropriate dimensions.

The Scientific Advisory Council supports ZFMK critically and constructively. However, it currently only meets every second year. **In accordance with standard practice at Leibniz institutions, it is recommended that the Scientific Advisory Board should meet at least once a year. It must also conduct an audit between two evaluations. This will make it easier to involve the Scientific Advisory Board more closely in ZFMK's strategic development.** In future, the Scientific Advisory Board should also be involved below management level in strategically important staff appointments (see also 5. Staff).

Implementation of recommendations from the last external evaluation

The recommendations made by the Senate of the Leibniz Association in 2007 (for details see Status report p. A-15f) have largely been successfully implemented.

Research profile

1) ZFMK has particularly sharpened its research profile in the field of molecular phylogenetics. Its work in this field attracts international attention.

Research infrastructure

2-4) The molecular laboratory was developed in line with recommendations by being extended to create the Centre for Molecular Biodiversity Research. This has now become the core of the museum's scientific activities and is well connected with the Centre for Taxonomy and Evolutionary Research. ZFMK plays a central role in DNA-barcoding in Germany.

5) A stronger geographic and general focus of the collections is still recommended.

6) The tissue bank is part of the DNA Bank Network and well connected both nationally and internationally.

7-9) These recommendations refer to the BIODAT database system that is no longer in operation at ZFMK. Since 2011, the Diversity Workbench system has gradually been introduced which is internationally compatible.

10-14) Both departments in the Centre for Taxonomy and Evolutionary Research have been strengthened in the last few years by new staff appointments. The groups are very active scientifically and very competitive internationally (see Section 3 for details of the individual departments). Research on animal vocalisation has been discontinued in accordance with recommendations.

15) The museum's research is still not sufficiently showcased in the exhibitions. Despite the improved staffing situation the museum is unable to exploit its potential for designing and developing its own special exhibitions (see Section 3. Subdivisions of ZFMK).

Structure and organisation

16-17) The establishment of the Centre for Molecular Biodiversity Research as an independent unit within ZFMK has proved worthwhile. As recommended, the head of the Centre is jointly appointed with the University of Bonn.

18) One of the recommendations at the last evaluation was to cover the need for expertise in bioinformatics through collaborations. A position at the museum was then not deemed necessary. For understandable reasons, ZFMK has raised third-party funding for personnel with the required expertise (Leibniz Competition). The results so far have been very good.

19) Due to having become legally independent, ZFMK will have a supervisory body.

20) The Equal Opportunities Commissioner is now elected in accordance with the regulations by the Implementation Agreement of the funding bodies (AV-Glei). With reference to gender equality ZFMK still has some catching up to do (see Section 5)

21) The funders now provide for the budget to be handled more flexibly. However, the management principles are still not in accordance with the resolutions made by the Federation and the *Länder* (see 2. General concept, Appropriateness of funding)

Staff and budget

22) ZFMK raises EU funding. A member of staff has been charged, amongst other duties, with EU fundraising.

23) Responsibility for ZFMK now resides with the BMBF.

Promotion of junior researchers and cooperation

24-25) In accordance with the recommendations, ZFMK now engages in teaching advanced university courses. The teaching load of the two jointly appointed scientists is in accordance with the Implementation Agreement of the funding bodies (AV-WGL).

26) In accordance with the recommendations, ZFMK networks with other natural history museums and collections in Germany.

Work results

27) ZFMK's publication record is very good with a pleasingly high proportion of peer-reviewed publications. See Section 3 for details of the publication performance in the individual Centres.

28) In accordance with the recommendations, the publication of inhouse journals has been reorganised. ZFMK now only publishes one journal.

Appendix

1. Review Board

Chair (Member of the Leibniz Senate Evaluation Committee)

Susanne **Foitzik** Institute of Zoology, Department of Evolutionary Biology, University of Mainz

Vice Chair (Member of the Leibniz Senate Evaluation Committee)

Günther **Schauerte** The Prussian Cultural Heritage Foundation, Berlin

Reviewers

Freek **Bakker** Biosystematics Group, Wageningen University and National Herbarium of the Netherlands

Heike **Feldhaar** Department of Population Ecology, University of Bayreuth

Martin S. **Fischer** Institute of Systematic Zoology and Evolutionary Biology with Phyletic Museum, Jena University

Richard **Lane** Scientific consultant (formerly Director of Science, Natural History Museum), London

Christy M. **McCain** Department of Ecology and Evolutionary Biology, Natural History Museum and University of Colorado at Boulder

Gerhard **Steiner** Department of Evolutionary Biology, University of Vienna

Diethard **Tautz** Max Planck Institute for Evolutionary Biology, Plön

Manfred **Verhaagh** Department of Life Sciences, State Museum of Natural History Karlsruhe

Erik **Verheyen** Molecular Laboratory, Royal Belgian Institute and Museum of Natural Sciences, Brussels

Representative of the Federal Government (Member of the Leibniz Senate Evaluation Committee)

Ulrich **Krafft** Federal Ministry of Education and Research, Bonn

Representative of the Länder Governments (Member of the Leibniz Senate Evaluation Committee)

absent with apologies

2. Guests

Representative of the relevant Federal government department

Cedric Janowicz Federal Ministry of Education and Research,
Bonn

Representative of the relevant Land government department

Michael H. Wappelhorst Ministry for Innovation, Science and Research
of the State of Nordrhein-Westfalen, Düsseldorf

Representative of the Scientific Advisory Board

Susanne Dobler Molecular Evolutionary Biology, Hamburg Uni-
versity

Representative of the Leibniz Association

Heribert Hofer Leibniz Institute for Zoo and Wildlife Research
(IZW), Berlin

Representative of the Joint Science Conference, Bonn

Rebekka Kötting

3. Representatives of partner institutions (for talks of approx. one hour with review board and guests)

Jürgen Fohrmann Rector of the University of Bonn

Karl Kjer Department of Entomology, Rutgers University,
New Brunswick, NJ

Juan Pablo Suárez Universidad Técnica Particular de Loja, Ecua-
dor

26 August 2013

Annex C: Statement of the Institution on the Evaluation Report

**Zoological Research Museum Alexander Koenig
- Leibniz Institute for Animal Biodiversity (ZFMK)
Bonn**

ZFMK appreciates the balanced and thorough evaluation, which highlights the institute's strengths and weaknesses, and we are grateful for the praise of several departments and achievements. The report is consistent with the impression the directorate had during the evaluation. Several recommendations require the allocation of additional resources, which were not available until recently, others can be implemented more easily. We are aware of the fact that despite our efforts during the past years, women are still underrepresented among our scientists and we are already implementing new procedures to increase the proportion of women. Improvements will be planned involving the Scientific Advisory Committee and the Foundation Council.

We want to point out a few misunderstandings and add some data:

- A goal of ZFMK is not the implementation of applied species ecology, but the elimination of the taxonomic impediment, which is an obstacle for (1) any biodiversity research that needs information at the species level and (2) for conservation biology. We are already developing technologies for this purpose, with strong support from the Federal Ministry for Education and Research (BMBF) and the German Science Foundation (DFG). The further development of these tools and testing them in applications would be the major objective of a new research unit of ZFMK.
- We welcome the recommendation to consolidate the personnel situation in our research departments, especially the strengthening of our technical staff. However, we want to point out that recently appointed new staff included both, researchers and technicians. Among our permanent staff the ratio of researchers to technical staff improved slightly from 1.33 in 2006 to 1.25 in 2013.
- The Vivarium is an important element of our permanent exhibition "Unser Blauer Planet – Leben in Netzwerk", which shows major ecosystems and habitats. The freshwater habitat, a main theme of the Vivarium, is not presented in the existing landscape displays "Rain Forest", "Desert", "African Savannah", "Central Europe", and "Polar Fauna". The Vivarium is very popular among teachers who visit the Museum with their classes, and it is a mainstay of our pedagogic program (Bonn has no zoo). Dismantling the Vivarium and the subsequent need to develop alternative displays would only aggravate the workload of our exhibition department.
- The progress of the digitisation of the ZFMK collections is comparable to that of other natural history museums in Germany. In the ZFMK collections 4.5 % of the specimen-based information has been digitised. Based on the average handling time of specimens in the different collections, we estimate that 10 persons currently would have to work full-time for 40 years in the ZFMK collections to achieve a complete digitisation. This would imply a complete stop of other curatorial work done by our technicians and it would endanger the survival of the collections. Because the situation in other institutes is the same, the Leibniz natural history museums together are developing an efficient strategy and jointly intend to ask BMBF for support.
- Concerning the EU program SYNTHESYS, ZFMK joined CETAF (the consortium of European biological natural history museums) several years ago and hoped to be included in this program, which had been coordinated by CETAF. However, due to the reduced funding for SYNTHESYS, CETAF decided not to enlarge the number of applicants.
- We feel responsible for the promotion of young scientists who finished Ph.D. projects in our institute. The Margarethe Koenig Prize was explicitly implemented to help young female scientists of ZFMK. Our budget should not be used to finance the post-docs of other institutes. Institutes who like this idea are encouraged to implement their own prizes while funding agencies could implement this pioneering idea as well. This would improve in fact the professional chances for many promising female talents.